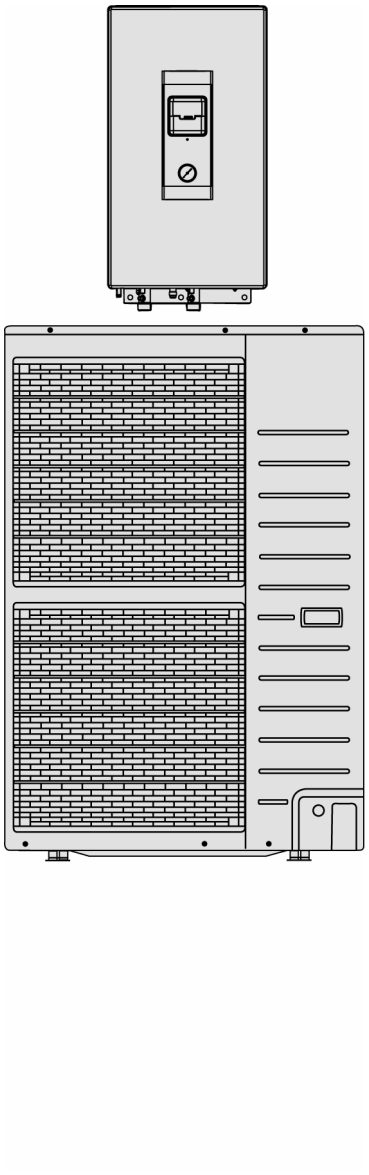
Order No. PHAAM1201104C2

# Service Manual

## Air-to-Water Heatpump



| Indoor Unit | Outdoor Unit |
|---|---|
| WH-SHF09D3E5 | WH-UH09DE5 |
| WH-SHF12D6E5 | WH-UH12DE5 |

**⚠ WARNING**

This service information is designed for experienced repair technicians only and is not designed for use by the general public.
It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

**⚠ PRECAUTION OF LOW TEMPERATURE**

In order to avoid frostbite, be assured of no refrigerant leakage during the installation or repairing of refrigerant circuit.

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# 1. Safety Precautions

- Read the following “SAFETY PRECAUTIONS” carefully before perform any servicing.
- Electrical work must be installed or serviced by a licensed electrician. Be sure to use the correct rating and main circuit for the model installed.
- The caution items stated here must be followed because these important contents are related to safety. The meaning of each indication used is as below. Incorrect installation or servicing due to ignoring of the instruction will cause harm or damage, and the seriousness is classified by the following indications.

| | |
|---|---|
| ⚠ **WARNING** | This indication shows the possibility of causing death or serious injury. |
| ⚠ **CAUTION** | This indication shows the possibility of causing injury or damage to properties. |

- The items to be followed are classified by the symbols:

| | |
|---|---|
| ⃠ | This symbol denotes item that is PROHIBITED from doing. |

- Carry out test run to confirm that no abnormality occurs after the servicing. Then, explain to user the operation, care and maintenance as stated in instructions. Please remind the customer to keep the operating instructions for future reference.

| ⚠ **WARNING** | |
|---|---|
| 1. Do not modify the machine, part or material during repairing service. | ⃠ |
| 2. If wiring unit is supplied as repairing part, do not repair or connect the wire even partial wire break. Exchange the whole wiring unit. | ⃠ |
| 3. Do not wrench the fasten terminal. Pull it out or insert it straightly. | ⃠ |
| 4. Do not install outdoor unit near handrail of veranda. When installing outdoor unit at veranda of high rise building, child may climb up to outdoor unit and cross over the handrail and causing accident. | ⃠ |
| 5. Do not use unspecified cord, modified cord, joint cord or extension cord for power supply cord. Do not share the single outlet with other electrical appliances. Poor contact, poor insulation or over current will cause electrical shock or fire. | ⃠ |
| 6. Do not tie up the power supply cord into a bundle by band. Abnormal temperature rise on power supply cord may happen. | ⃠ |
| 7. Do not insert your fingers or other objects into the unit, high speed rotating fan may cause injury. | ⃠ |
| 8. Do not sit or step on the unit, you may fall down accidentally. | ⃠ |
| 9. Keep plastic bag (packaging material) away from small children, it may cling to nose and mouth and prevent breathing. | ⃠ |
| 10. Do not use pipe wrench to install refrigerant piping. It might deform the piping and cause the unit to malfunction. | ⃠ |
| 11. Do not purchase unauthorized electrical parts for installation, service, maintenance and etc.. They might cause electrical shock or fire. | ⃠ |
| 12. Do not modify the wiring of indoor/outdoor unit for installation of other components (i.e. heater, etc). Overloaded wiring or wire connection points may cause electrical shock or fire. | ⃠ |
| 13. Do not add or replace refrigerant other than specified type. It may cause product damage, burst and injury etc. | ⃠ |
| 14. For electrical work, follow local wiring standard, regulation and this installation instruction. An independent circuit and single outlet must be used. If electrical circuit capacity is not enough or defect found in electrical work, it will cause electrical shock or fire. | |
| 15. For water circuit installation work, follow to relevant European and national regulations (including EN61770) and local plumbing and building regulation codes. | |
| 16. Engage dealer or specialist for installation or servicing. If the installation or servicing done by the user is defective, it will cause water leakage, electrical shock or fire. | |
| 17. This is a R407C model, when connecting the piping, do not use any existing (R22) pipes and flare nuts. Using such same may cause abnormally high pressure in the refrigeration cycle (piping), and possibly result in explosion and injury. Use only R407C refrigerant. Thickness or copper pipes used with R407C must be 0.8 mm or more. Never use copper pipes thinner than 0.8 mm. It is desirable that the amount of residual oil is less than 40 mg/10 m. | |
| 18. When install or relocate Air to Water Heatpump indoor/outdoor unit, do not let any substance other than the specified refrigerant, eg. air etc mix into refrigerant cycle (piping). Mixing of air etc. will cause abnormal high pressure in refrigeration cycle and result in explosion, injury etc. | |

19. Install according to this installation instructions strictly. If installation is defective, it will cause water leakage, electrical shock or fire.

20. Install at a strong and firm location which is able to withstand the set's weight. If the strength is not enough or installation is not properly done, the set will drop and cause injury.

21. Do not use joint cable for indoor/outdoor connection cable. Use specified indoor/outdoor connection cable, refer to instruction **CONNECT THE CABLE TO THE INDOOR UNIT** and connect tightly for indoor/outdoor connection. Clamp the cable so that no external force will be acted on the terminal. If connection or fixing is not perfect, it will cause heat up or fi re at the connection.

22. This equipment is strongly recommended to be installed with Residual Current Device (RCD) on-site according to the respective national wiring rules or country-specific safety measures in terms of residual current.

23. During installation, install the refrigerant piping properly before run the compressor. Operation of compressor without fixing refrigeration piping and valves at opened condition will cause suck-in of air, abnormal high pressure in refrigeration cycle and result in explosion, injury etc.

24. During pump down operation, stop the compressor before remove the refrigeration piping. Removal of refrigerant piping while compressor is operating and valves are opened will cause suck-in of air, abnormal high pressure in refrigerant cycle and result in explosion, injury etc.

25. Tighten the flare nut with torque wrench according to specified method. If the flare nut is over tightened, after a long period, the flare may break and cause refrigerant gas leakage.

26. After completion of installation, confirm there is no leakage of refrigerant gas. It may generate toxic gas when the refrigerant contacts with fire.

27. Ventilate the room if there is refrigerant gas leakage during operation. Extinguish all fire sources if present. It may cause toxic gas when the refrigerant contacts with fire.

28. Only use the supplied or specified installation or servicing parts, else, it may cause unit vibrate loose, water leakage, electrical shock or fire.

29. The unit is only for use in a closed water system. Utilization in an open water circuit may lead to excessive corrosion of water piping and risk of incubating bacteria colonies, particularly Legionella, in water.

30. If there is any doubt about the installation procedure or operation, always contact the authorized dealer for advice and information.

31. Select a location where in case of water leakage, the leakage will not cause damage to other properties.

32. When installing electrical equipment at wooden building of metal lath or wire lath, in accordance with electrical facility standard, no electrical contact between equipment and building is allowed. Insulator must be installed in between.

33. Work done to the indoor/outdoor unit after remove the front plate cover that secured by screws, must be carried out under the supervision of authorized dealer and licensed installation contractor.

34. This equipment must be properly earthed. Earth line must not be connected to gas pipe, water pipe, earth of lightning rod and telephone. Otherwise, it may cause electrical shock in case equipment breakdown or insulation breakdown.

**CAUTION**

1. Do not install the air-to-water heatpump indoor unit and outdoor unit at place where leakage of flammable gas may occur. In case gas leaks and accumulates at surrounding of the unit, it may cause fire.

2. Do not release refrigerant.
   Do not release refrigerant during piping work for installation, re-installation and during repairing a refrigeration parts. Take care of the liquid refrigerant, it may cause frostbite.

3. Do not install this appliance in a laundry room or other high humidity location. This condition will cause rust and damage to the unit.

4. Make sure the insulation of power supply cord does not contact hot part (i.e. refrigerant piping, water piping) to prevent from insulation failure (melt).

5. Do not touch the sharp aluminium fin, sharp parts may cause injury.

6. Do not apply excessive force to water pipes that may damage the pipes. If water leakage occur, it will cause flooding and damage to other properties.

7. Carry out drainage piping as mentioned in installation instructions. If drainage is not perfect, water may enter the room and damage the furniture.

8. Select an installation location which is easy for maintenance.

9. Power supply connection to indoor unit.
   - Power supply point should be in easily accessible place for power disconnection in case of emergency.
   - Must follow local national wiring standard, regulation and this installation instruction.
   - Strongly recommended to make permanent connection to a circuit breaker. It must be a double pole switch with a minimum 3.0 mm gap.
     - Use approved 30A circuit breaker for power supply 1
     - Use approved 30A circuit breaker for power supply 2
     - Use approved 15A/16A circuit breaker for power supply 3 (Not applicable for SHF09D3E5)

10. Ensure the correct polarity is maintained throughout all wiring. Otherwise, it will cause electrical shock or fire.

11. After installation, check the water leakage condition in connection area during test run. If leakage occur, it will cause damage to other properties

12. Installation work.
    It may need two or more people to carry out the installation work. The weight of indoor/outdoor unit might cause injury if carried by one person.

# 2. Specifications

## *2.1 WH-SHF09D3E5 WH-UH09DE5*

| Item | | Unit | Outdoor Unit | |
|---|---|---|---|---|
| Performance Test Condition | | | EN14511 | |
| Heating Capacity | | Condition (Ambient/Water) | A7W35 | A2W35 |
| | | kW | 9.00 | 9.00 |
| | | BTU/h | 30700 | 30700 |
| | | kcal/h | 7740 | 7740 |
| COP | | W/W | 4.55 | 3.40 |
| | | kcal/hW | 3.91 | 2.92 |
| Noise Level | | dB (A) | 49 | - |
| | | Power Level dB | 66 | - |
| Air Flow | | $m^3$/min ($ft^3$/min) | 76.8 (2710) | |
| Refrigeration Control Device | | | Expansion Valve | |
| Refrigeration Oil | | $cm^3$ | FV50S (1600) | |
| Refrigerant (R407C) | | kg (oz) | 2.99 (105.5) | |
| Dimension | Height | mm (inch) | 1340 (52-3/4) | |
| | Width | mm (inch) | 900 (35-7/16) | |
| | Depth | mm (inch) | 320 (12-19/32) | |
| Net Weight | | kg (lbs) | 105 (232) | |
| Pipe Diameter | Liquid | mm (inch) | 9.52 (3/8) | |
| | Gas | mm (inch) | 15.88 (5/8) | |
| Standard Length | | m (ft) | 7 (23.0) | |
| Pipe Length Range | | m (ft) | 3 (9.8) ~ 30 (98.4) | |
| I/D & O/D Height Difference | | m (ft) | 20 (65.6) | |
| Additional Gas Amount | | g/m (oz/ft) | 70 (0.8) | |
| Refrigeration Charge Less | | m (ft) | 15 (49.2) | |
| Compressor | Type | | Hermetic Motor (Rotary) | |
| | Motor Type | | Brushless (4-poles) | |
| | Rated Output | kW | 3.00 | |
| Fan | Type | | Propeller Fan | |
| | Material | | PP | |
| | Motor Type | | Induction (8-poles) | |
| | Input Power | W | — | |
| | Output Power | W | 60 | |
| | Fan Speed | rpm | 490 (Top Fan) 530 (Bottom Fan) | |
| Heat Exchanger | Fin material | | Aluminium (Pre Coat) | |
| | Fin Type | | Corrugated Fin | |
| | Row × Stage × FPI | | 2 × 51 × 19 | |
| | Size (W × H × L) | mm | 898.8 × 1295.4 × 38.1 | |

| Item | Unit | | |
|---|---|---|---|
| Power Source (Phase, Voltage, Cycle) | ø | Single | |
| | V | 230 | |
| | Hz | 50 | |
| Power Supply 1: Phase / Max. Current / Max. Input Power | ø / A / W | Single / 28.5 / 5.97k | |
| Power Supply 2: Phase / Max. Current / Max. Input Power | ø / A / W | Single / 26.0 / 6.00k | |
| Input Power | kW | 1.98 | 2.65 |
| Maximum Input Power For Heat Pump System | kW | 5.97 | |
| Starting Current | A | 9.5 | |

| Item | | Unit | | |
|---|---|---|---|---|
| Running Current | | A | 9.5 | 12.7 |
| Maximum Current For Heat Pump System | | A | 28.5 | |
| Power Factor | | % | 91 | 91 |
| Power factor means total figure of compressor and outdoor fan motor. | | | | |
| Power Cord | Number of core | | - | |
| | Length | m (ft) | - | |
| Thermostat | | | Electronic Control | |
| Protection Device | | | Electronic Control | |

| Item | | | Unit | Indoor Unit |
|---|---|---|---|---|
| Performance Test Condition | | | | EN14511 |
| Operation Range | Outdoor Ambient | | °C | -20 ~ 35 |
| | Water Outlet | | °C | 25 ~ 65 |
| Internal Pressure Differential | | | kPa | 13.8 |
| Noise Level | | | dB (A) | 30 |
| | | | Power Level dB | 43 |
| Dimension | Height | | mm (inch) | 892 (35-1/8) |
| | Width | | mm (inch) | 502 (19-3/4) |
| | Depth | | mm (inch) | 353 (13-29/32) |
| Net Weight | | | kg (lbs) | 50 (110) |
| Refrigerant Pipe Diameter | Liquid | | mm (inch) | 9.52 (3/8) |
| | Gas | | mm (inch) | 15.88 (5/8) |
| Water Pipe Diameter | Inlet | | mm (inch) | 28 (1-3/32) |
| | Outlet | | mm (inch) | 28 (1-3/32) |
| Water Drain Hose Inner Diameter | | | mm (inch) | 15.00 (19/32) |
| Pump | Motor Type | | | Capacitor Run Induction Motor (5 μF) |
| | No. of Speed | | | 3 |
| | Input Power | | W | 180 |
| Hot Water Coil | Type | | | Brazed Plate |
| | No. of Plates | | | 100 |
| | Size (W x H x L) | | mm | 161 × 93 × 325 |
| | Water Flow Rate | | l/min ($m^3$/h) | 25.8 (1.5) |
| Pressure Relief Valve Water Circuit | | | kPa | Open: 300, Close: 265 and below |
| Flow Switch | | | | Magnetic Lead Switch |
| Protection Device | | | A | Residual Current Circuit Breaker / Earth Leakage Circuit Breaker (40) |
| Expansion Vessel | | Volume | l | 10 |
| | | MWP | bar | 1 |
| Capacity of Integrated Electric Heater | | | kW | 3.00 |

**Note:**

- Heating capacities are based on outdoor air temperature of 7°C Dry Bulb (44.6°F Dry Bulb), 6°C Wet Bulb (42.8°F Wet Bulb) with controlled indoor water inlet temperature of 30°C and water outlet temperature of 35°C.
- Specification are subjected to change without prior notice for further improvement.

## 2.2 WH-SHF12D6E5 WH-UH12DE5

| Item | | Unit | Outdoor Unit | |
|---|---|---|---|---|
| Performance Test Condition | | | EN14511 | |
| Heating Capacity | | Condition (Ambient/Water) | A7W35 | A2W35 |
| | | kW | 12.00 | 12.00 |
| | | BTU/h | 41000 | 41000 |
| | | kcal/h | 10320 | 10320 |
| COP | | W/W | 4.40 | 3.23 |
| | | kcal/hW | 3.78 | 2.77 |
| Noise Level | | dB (A) | 50 | - |
| | | Power Level dB | 67 | - |
| Air Flow | | $m^3$/min ($ft^3$/min) | 80.0 (2830) | |
| Refrigeration Control Device | | | Expansion Valve | |
| Refrigeration Oil | | $cm^3$ | FV50S (1600) | |
| Refrigerant (R407C) | | kg (oz) | 2.99 (105.5) | |
| Dimension | Height | mm (inch) | 1340 (52-3/4) | |
| | Width | mm (inch) | 900 (35-7/16) | |
| | Depth | mm (inch) | 320 (12-19/32) | |
| Net Weight | | kg (lbs) | 105 (232) | |
| Pipe Diameter | Liquid | mm (inch) | 9.52 (3/8) | |
| | Gas | mm (inch) | 15.88 (5/8) | |
| Standard Length | | m (ft) | 7 (23.0) | |
| Pipe Length Range | | m (ft) | 3 (9.8) ~ 30 (98.4) | |
| I/D & O/D Height Difference | | m (ft) | 20 (65.6) | |
| Additional Gas Amount | | g/m (oz/ft) | 70 (0.8) | |
| Refrigeration Charge Less | | m (ft) | 15 (49.2) | |
| Compressor | Type | | Hermetic Motor (Rotary) | |
| | Motor Type | | Brushless (4-poles) | |
| | Rated Output | kW | 3.00 | |
| Fan | Type | | Propeller Fan | |
| | Material | | PP | |
| | Motor Type | | Induction (8-poles) | |
| | Input Power | W | — | |
| | Output Power | W | 60 | |
| | Fan Speed | rpm | 520 (Top Fan) 560 (Bottom Fan) | |
| Heat Exchanger | Fin material | | Aluminium (Pre Coat) | |
| | Fin Type | | Corrugated Fin | |
| | Row × Stage × FPI | | 2 × 51 × 19 | |
| | Size (W × H × L) | mm | 898.8 × 1295.4 × 38.1 | |

| Item | Unit | | |
|---|---|---|---|
| Power Source (Phase, Voltage, Cycle) | ø | Single | |
| | V | 230 | |
| | Hz | 50 | |
| Power Supply 1: Phase / Max. Current / Max. Input Power | ø / A / W | Single / 29.0 / 6.20k | |
| Power Supply 2: Phase / Max. Current / Max. Input Power | ø / A / W | Single / 26.0 / 6.00k | |
| Power Supply 3: Phase / Max. Current / Max. Input Power | ø / A / W | Single / 13.0 / 3.00k | |
| Input Power | kW | 2.73 | 3.72 |
| Maximum Input Power For Heat Pump System | kW | 6.20 | |
| Starting Current | A | 13.0 | |

| Item | | Unit | | |
|---|---|---|---|---|
| Running Current | | A | 13.0 | 17.4 |
| Maximum Current For Heat Pump System | | A | 29.0 | |
| Power Factor | | % | 91 | 93 |
| Power factor means total figure of compressor and outdoor fan motor. | | | | |
| Power Cord | Number of core | | - | |
| | Length | m (ft) | - | |
| Thermostat | | | Electronic Control | |
| Protection Device | | | Electronic Control | |

| Item | | | Unit | Indoor Unit |
|---|---|---|---|---|
| Performance Test Condition | | | | EN14511 |
| Operation Range | Outdoor Ambient | | °C | -20 ~ 35 |
| | Water Outlet | | °C | 25 ~ 65 |
| Internal Pressure Differential | | | kPa | 23.7 |
| Noise Level | | | dB (A) | 30 |
| | | | Power Level dB | 43 |
| Dimension | Height | | mm (inch) | 892 (35-1/8) |
| | Width | | mm (inch) | 502 (19-3/4) |
| | Depth | | mm (inch) | 353 (13-29/32) |
| Net Weight | | | kg (lbs) | 52 (115) |
| Refrigerant Pipe Diameter | Liquid | | mm (inch) | 9.52 (3/8) |
| | Gas | | mm (inch) | 15.88 (5/8) |
| Water Pipe Diameter | Inlet | | mm (inch) | 28 (1-3/32) |
| | Outlet | | mm (inch) | 28 (1-3/32) |
| Water Drain Hose Inner Diameter | | | mm (inch) | 15.00 (19/32) |
| Pump | Motor Type | | | Capacitor Run Induction Motor (5 μF) |
| | No. of Speed | | | 3 |
| | Input Power | | W | 180 |
| Hot Water Coil | Type | | | Brazed Plate |
| | No. of Plates | | | 100 |
| | Size (H x W x L) | | mm | 161 × 93 × 325 |
| | Water Flow Rate | | l/min ($m^3$/h) | 34.4 (2.1) |
| Pressure Relief Valve Water Circuit | | | kPa | Open: 300, Close: 265 and below |
| Flow Switch | | | | Magnetic Lead Switch |
| Protection Device | | | A | Residual Current Circuit Breaker / Earth Leakage Circuit Breaker (40) |
| Expansion Vessel | | Volume | l | 10 |
| | | MWP | bar | 1 |
| Capacity of Integrated Electric Heater | | | kW | 6.00 |

**Note:**

- Heating capacities are based on outdoor air temperature of 7°C Dry Bulb (44.6°F Dry Bulb), 6°C Wet Bulb (42.8°F Wet Bulb) with controlled indoor water inlet temperature of 30°C and water outlet temperature of 35°C.
- Specification are subjected to change without prior notice for further improvement.

# 3. Features

- **Inverter Technology**
  - Energy saving
- **High Efficiency**
- **Compact Design**
- **Environment Protection**
  - Non-ozone depletion substances refrigerant (R407C)
- **Long Installation Piping**
  - Long piping up to 30 meter with height difference 20 meter
  - Flexible 4-way piping for outdoor unit
- **Easy to use control panel**
- **Weekly Timer setting**
- **Quality Improvement**
  - Random auto restart after power failure for safety restart operation
  - Gas leakage protection
  - Prevent compressor reverse cycle
  - Inner protector to protect compressor
- **Serviceability Improvement**
  - Breakdown Self Diagnosis function
  - System Status Check Buttons for servicing purpose
  - System Pumpdown Button for servicing purpose
  - Front maintenance design for outdoor unit
- **Operation Condition**

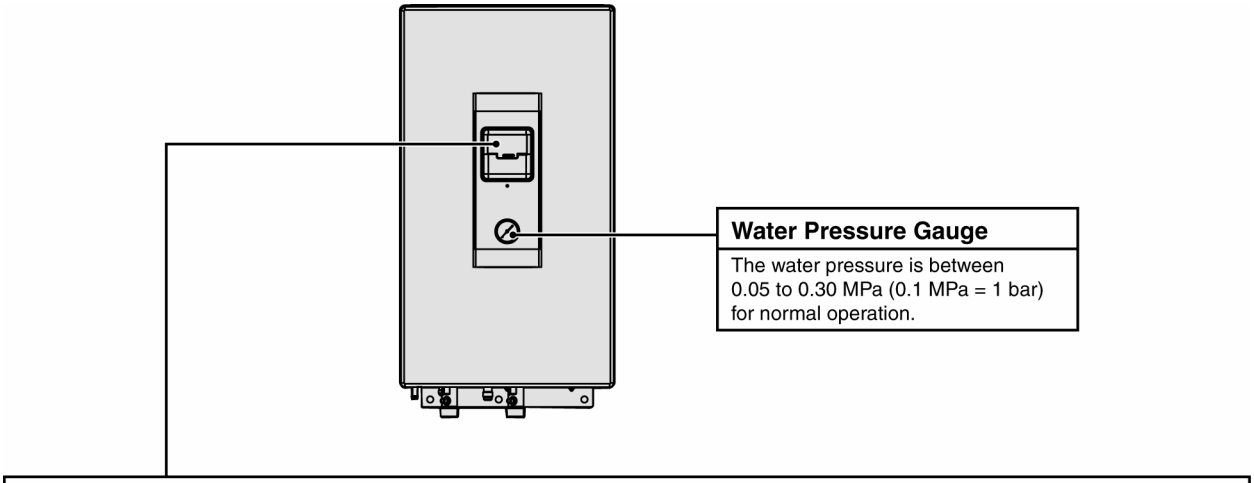
| | | Indoor | Outdoor |
|---|---|---|---|
| | | Water outlet temperature (°C) | Ambient temperature (°C) |
| HEATING | Maximum | 65 | 35 |
| | Minimum | 25 | -20 |

NOTICE : When the outdoor temperature is out of the above temperature range, the heating capacity will drop significantly and outdoor unit might stop for protection control.

# 4. Location of Controls and Components

## *4.1 Indoor Unit*

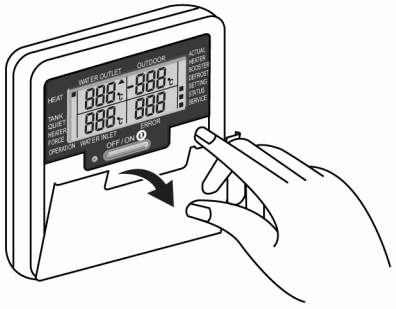
### 4.1.1 Location of Control



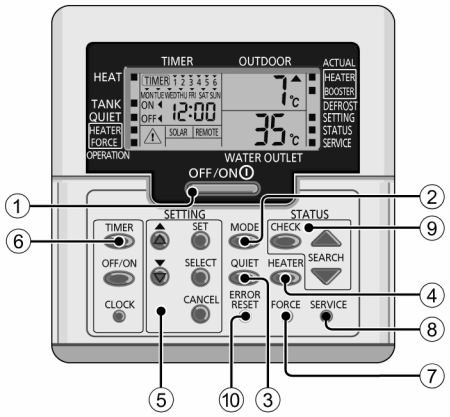
**Water Pressure Gauge**

The water pressure is between 0.05 to 0.30 MPa (0.1 MPa = 1 bar) for normal operation.

**Control Panel's Button**



Open cover for buttons selections.




① **OFF/ON Button**

This button starts or stops the mode operation function of the unit.

② **Mode Button**

This button is to set operation mode.

The mode does the following transition by button operation.

Heat → Heat + Tank → Tank

③ **Quiet Button**

This button is to enjoy quiet environment by reduces outdoor unit noise.

④ **Heater Button**

This button is to select backup heater mode operation.

### ⑤ System Setting Button

These setting button can change the temperature range of setup setting mode selection.
Perform the steps below to set preferred temperature range.
STEP 1: Press SET button for 5 seconds to enter setting mode.
STEP 2: Press upward or downward button to choose the 7 of the parameter as below for change the temperature range.

1) Low outdoor ambient set temperature
   (Selection range: -15°C ~ 15°C).
2) High outdoor ambient set temperature
   (Selection range: -15°C ~ 15°C).
3) Water outlet set temperature at low outdoor ambient temperature
   (Selection range: 25°C ~ 65°C).
4) Water outlet set temperature at high outdoor ambient temperature
   (Selection range: 25°C ~ 65°C).
5) Set temperature for turning OFF heating operation (Selection range: 5°C ~ 35°C).
6) Outdoor ambient set temperature for turning ON heater operation (Selection range: -15°C ~ 20°C).
7) Sanitary tank set temperature (Selection range: 40°C ~ 75°C).

STEP 3: Press SELECT button to enter selected parameter.
STEP 4: Press upward or downward button to set the desired temperature.
STEP 5: Press SET button again to confirm the setting.
Note: Repeat steps 2 to 5 to set other parameters.
STEP 6: Press CANCEL button or wait 30 seconds to exit “SETTING” mode.

**Water Temperature Thermo Shift Setting**
Perform the steps below to set the desired shift temperature.
STEP 1: Press SET button within 5 seconds.
STEP 2: Press SELECT button to enter the setting temperature.
STEP 3: Press upward or downward button to set desired temperature (Selection range: -5°C ~ 5°C).
STEP 4: Press SET button again to confirm the setting.
STEP 5: Press CANCEL button or wait 30 seconds to exit setting.

### ⑥ Timer Button

This button is to set weekly timer and clock-time combine with setting button.
Perform the steps below to setting the current day and time.
STEP 1: Press CLOCK button.
STEP 2: Press SETTING upward or downward buttons to set current day.
STEP 3: Press SET button to confirm.
STEP 4: Repeat STEP 2 and 3 to set the current time.
Note: The current time that has been set will be the standard time for all the Timer Operations.

### ⑦ Force Button

This button is to select force heater mode operation.
Press OFF/ON button to stop the force heater mode operation.

### ⑧ System Service Button

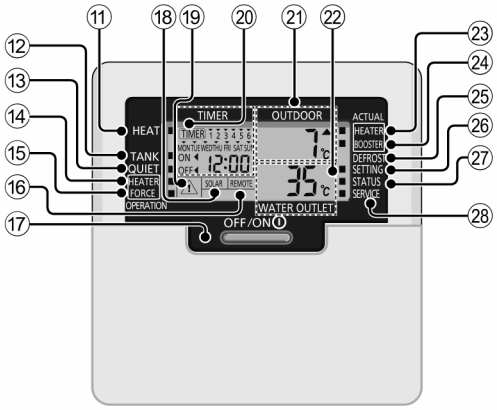
### ⑨ System Status Check Button

This button is to check the various mode status.
Perform the steps below to check the selection status.
STEP 1: Press CHECK button for 5 seconds to enter STATUS mode.
STEP 2: Press SEARCH Upward or Downward buttons for checking below value,
1.Compressor running frequency
2.Error history
3.Water inlet temperature
4.Tank Temperature
STEP 3: Press CANCEL button to exit STATUS mode.

### ⑩ Error Reset Button

This button is to reset the control panel and system error code.

**Control Panel's Display**




⑪ **Heat Mode OFF/ON Indicator**
This icon indicates heating mode operation.

⑫ **Tank Mode Indicator**
This icon indicates tank mode operation.

⑬ **Quiet Mode Indicator**
This icon indicates quiet mode operation.

⑭ **HEATER Indicator**
This icon indicates backup heater mode operation.

⑮ **FORCE Indicator**
This icon indicates force heater mode operation.

⑯ **Remote Display**
This LCD show the external thermo controller connected display.

⑰ **Operation LED**
This LED indicates the unit is in operation.

⑱ **Solar Display**
This LCD show the solar display.

⑲ **Caution (Tank Temperature above 60°C) Indicator**
This LCD show the Caution display.

⑳ **Timer/Clock Setting display**
This LCD show the weekly schedule timer setting and clock display.

㉑ **Outdoor Ambient Temperature Display**
This LCD show the outdoor ambient temperature.

㉒ **Water Outlet Temperature Display**
This LCD show the water outlet temperature.

㉓ **HEATER indicator**
This icon indicates backup heater actual operation.

㉔ **BOOSTER indicator**
This icon indicates booster heater actual operation.

㉕ **DEFROST indicator**
This icon indicates the system defrost operation request OFF/ON display.

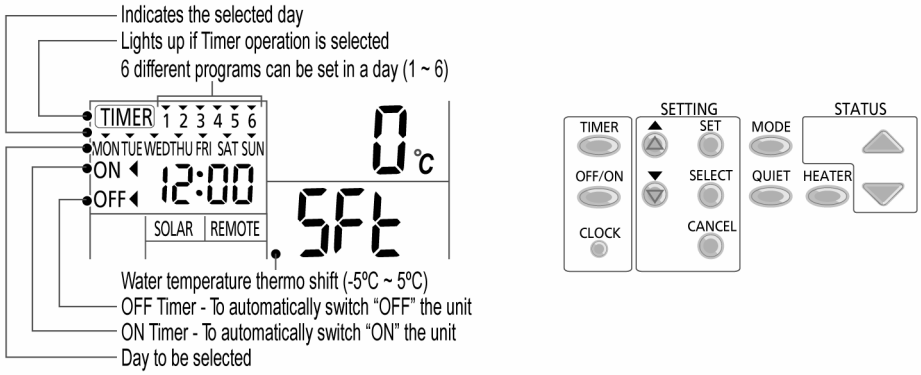
㉖ **System Setting Indicator**
This icon indicates the system setting mode request OFF/ON display.

㉗ **System Status Indicator**
This icon indicates the status check mode request OFF/ON display.

㉘ **System Service Indicator**
This icon indicates the system service mode request OFF/ON display.

## 4.1.2 Weekly Timer Setting

**Timer Display**

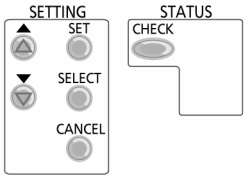



| Function | Step |
|---|---|
| Enter timer mode | Press TIMER. |
| Set day & time | 1. Press ▲ or ▼ to select your desired day.<br>2. Press SELECT to confirm.<br>3. "1" will be blinking, press SELECT to set program 1.<br>4. Press OFF/ON to select ON or OFF timer.<br>5. Press ▲ or ▼ to select your desired time.<br>You can set MODE, QUIET, HEATER and desired shift temperature ▲ ▼ with timer.<br>6. Press SET to confirm program 1. The selected day will be highlighted with ▼ .<br>• After 2 seconds, the display will move to the next program.<br>7. Repeat steps 4 to 7 to set programs 2 to 6.<br>• During timer setup, if no button is pressed within 30 seconds, or if the SET button is pressed the setting at that moment is confirmed and timer setup is ended. |
| Add/Modify timer | Repeat the steps above. |
| Disable timer | Press TIMER, then press CANCEL . |
| Enable timer | Press TIMER, then press SET. |
| Check timer | 1. Press TIMER.<br>2. Press ▲ or ▼ until your desired day is shown, press SELECT to confirm your selection.<br>3. Press ▲ or ▼ to check the set programs. |
| Cancel timer | 1. Press TIMER.<br>2. Press ▲ or ▼ until your desired day is shown, press SELECT to confirm your selection.<br>3. Press SELECT to enter program setting.<br>4. Press ▲ or ▼ until your desired program is shown.<br>5. Press CANCEL to cancel the program. |

Notes:
- You can set the Timer for each day of the week (Monday to Sunday) with 6 programs per day.
- When the unit is switched on by the ON TIMER, it will use the previously set temperature to control the water outlet temperature.
- Same timer program cannot be set in the same day.
- You may also select collective days with same timer setting.
- Promotes energy saving by allowing you to set up to 6 programs in any given day.

## 4.1.3 Setting Up the Special Functions

- After initial installation, you can manually adjust the settings. The initial setting remains active until the user changes it.
- The control panel can be used for multiple installations. Some functions may not be applicable to your unit.
- Ensure the operation LED is in OFF condition before setting.



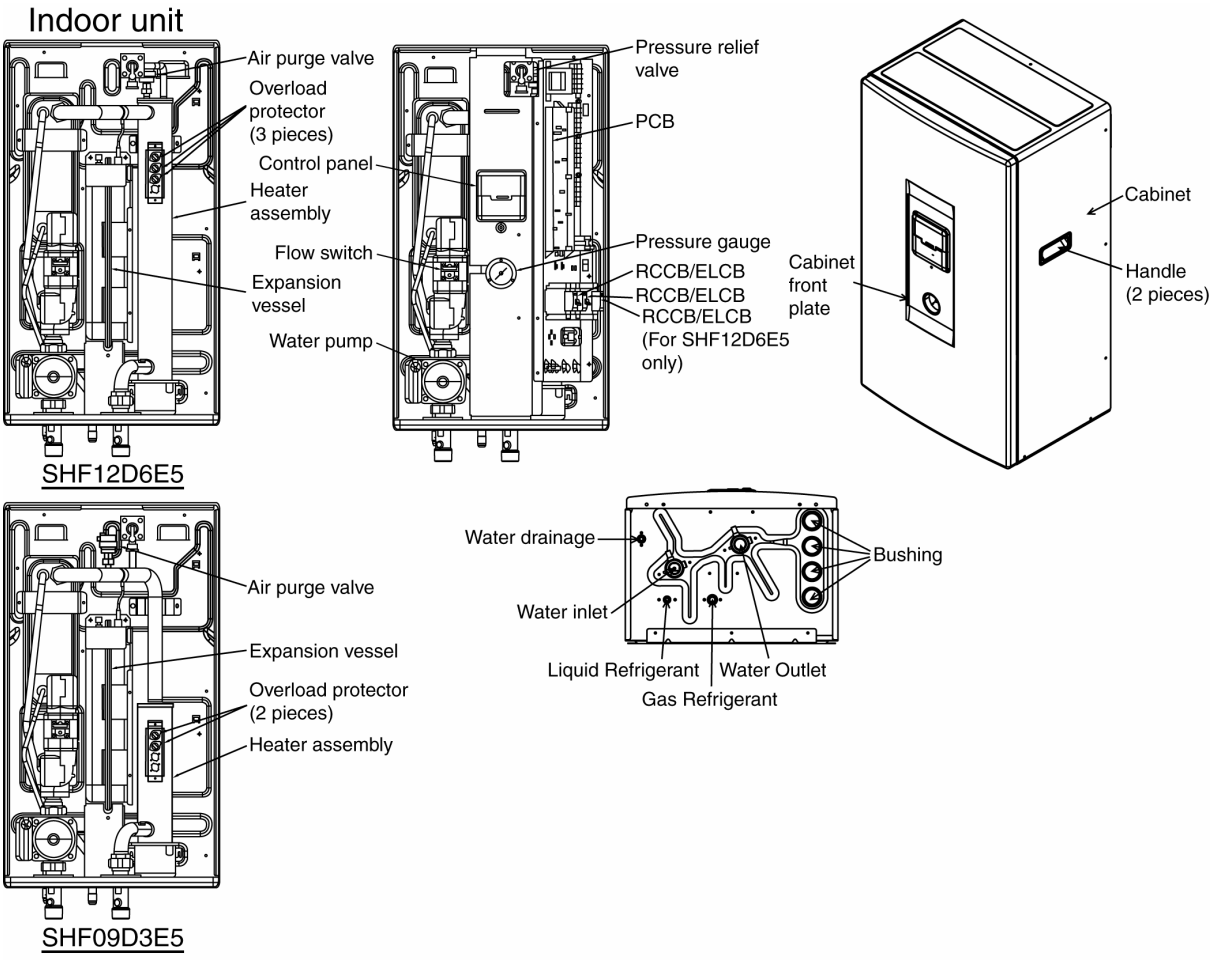

1. Press SET and CHECK simultaneously for 5 seconds to enter special setting mode.
   "SETTING" and "STATUS" indicator is ON.
2. Press ▲ or ▼ to browse functions.
3. Press SELECT to enter function.
4. Press ▲ or ▼ to enable **YES** or disable **NO** function, or set other options.
5. Press SET to confirm.

| Set | Control Panel's Display | | Description |
|---|---|---|---|
| 1 | roOn | con | External Thermo Controller (YES / NO)<br>To set external thermo controller connection. |
| 2 | HEATER | CAP | Indoor Backup Heater Capacity Selection (3kW / 6kW / 9kW)<br>To reduce the heater power whenever unnecessary. Options vary depending on model. |
| 3 | Ant1 | FrE | Water System Freeze Prevention Function (YES / NO)<br>To activate or deactivate water system freeze prevention function when unit is OFF. |
| 4 | TANK | con | Tank Connection (YES / NO)<br>To set tank connection.<br>Note: If select "Tank connection" is "NO", Set 5 ~ 14 are skipped. |
| 5 | SOLAR | Pry | Solar Priority (YES / NO)<br>To choose the solar use for water tank heat up. |
| 6 | HEAT | Pry | Heating Priority (YES / NO)<br>To choose the room heating as priority during HEAT + TANK mode.<br>Note: If select "Heating priority" is "YES", Set 7 ~ 8 are skipped. |
| 7 | HEAT | int | Heating operation Interval Set<br>To set timer for Heat mode during HEAT + TANK mode (0.5hour ~ 10 hours). |
| 8 | TANK | int | Tank Heat-up Interval Set<br>To set timer for Tank during HEAT + TANK mode (5minutes ~ 1hour 35minutes). |
| 9 | BOOSTER | htr | Booster Heater Function (YES / NO)<br>To activate or deactivate tank booster heater function<br>Note: If select "Booster heater function" is "NO", Set 10 is skipped. |
| 10 | BOOSTER | dLY | Booster Heater Delay Timer Set<br>To set delay timer for booster heater to ON if water tank temperature is not reached (20minutes ~ 1hour 35minutes). |

**• Do not use the system during sterilization to prevent burnt or overheat during shower.**
**• The sterilization function field settings must be configured by the authorized dealer according to local laws and regulation.**

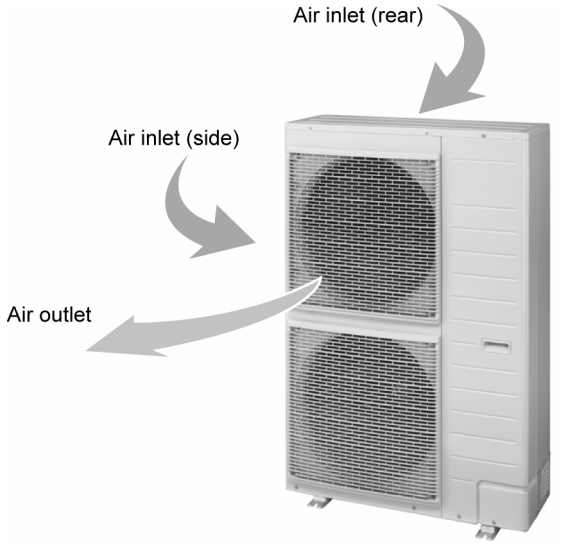
| | | | |
|---|---|---|---|
| 11 | StrL | Fun | Sterilization (YES / NO)<br>To set sterilization, if required.<br>Note: If select "Sterilization" is "NO", set 12 ~ 14 are skipped. |
| 12 | Str | | Sterilization Day & Time Set<br>To set timer for sterilization (only once a week, will operate even in standby condition). |
| 13 | StrL | bo1 | Sterilization Temperature Set<br>To set temperature for sterilization function (40°C ~ 75°C). |
| 14 | Str | oPr | Sterilization Continue Time<br>To set timer to maintain heating temperature in order to complete the sterilization function (5minutes ~ 1hour). |

### 4.1.4 Main Components




| | |
|---|---|
| Water pump: | The pump circulates the water in the water circuit. |
| Pressure gauge: | The manometer allows read out of the water pressure in the water circuit. |
| Flow switch: | The flow switch checks the flow in the water circuit and protects the heat exchanger against high pressure built-up and the pump against damage. |
| Pressure relief valve: | The pressure relief valve prevents excessive water pressure in the water circuit (> 290kPa). |
| Control panel: | The user interface allows the installer and user to setup, use and maintain the unit. |
| Electric Heater: | Additional heating capacity to the system when water and ambient temp is low. |
| Expansion Vessel: | Storage for excessive water. |

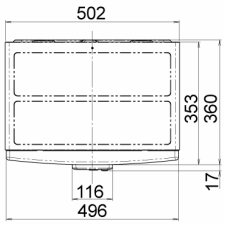
## *4.2 Outdoor Unit*



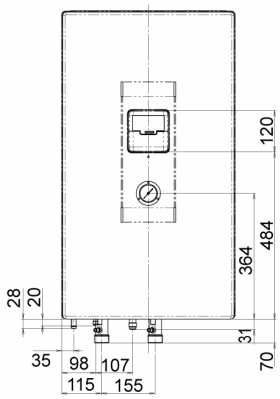
# 5. Dimensions

## *5.1 Indoor Unit*

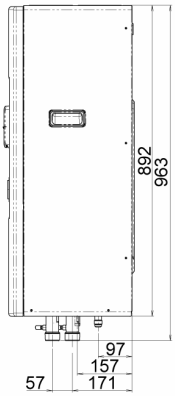
<Top View>



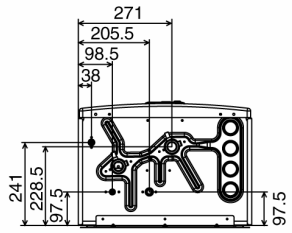

<Front View>



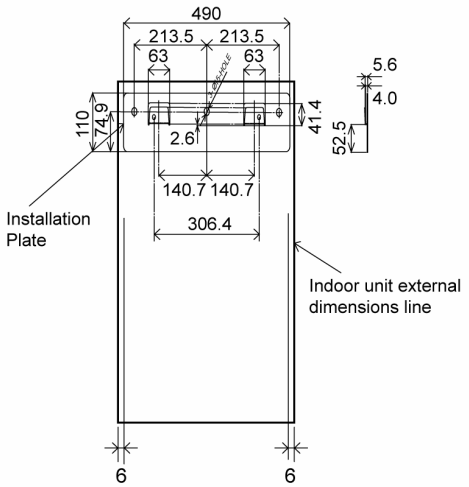

<Side View>




<Bottom View>

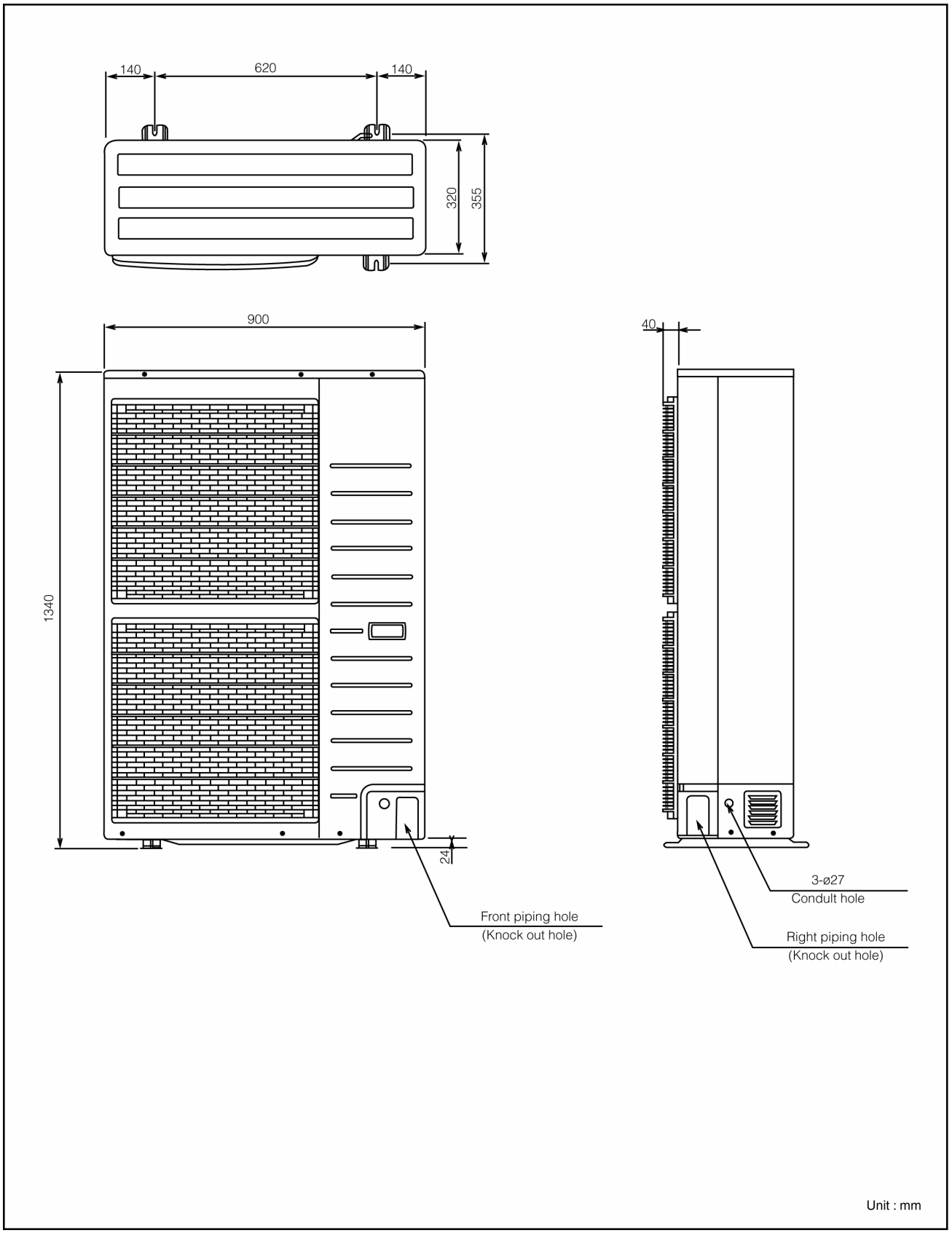



Relative position between the indoor unit and the installation plate <Front View>

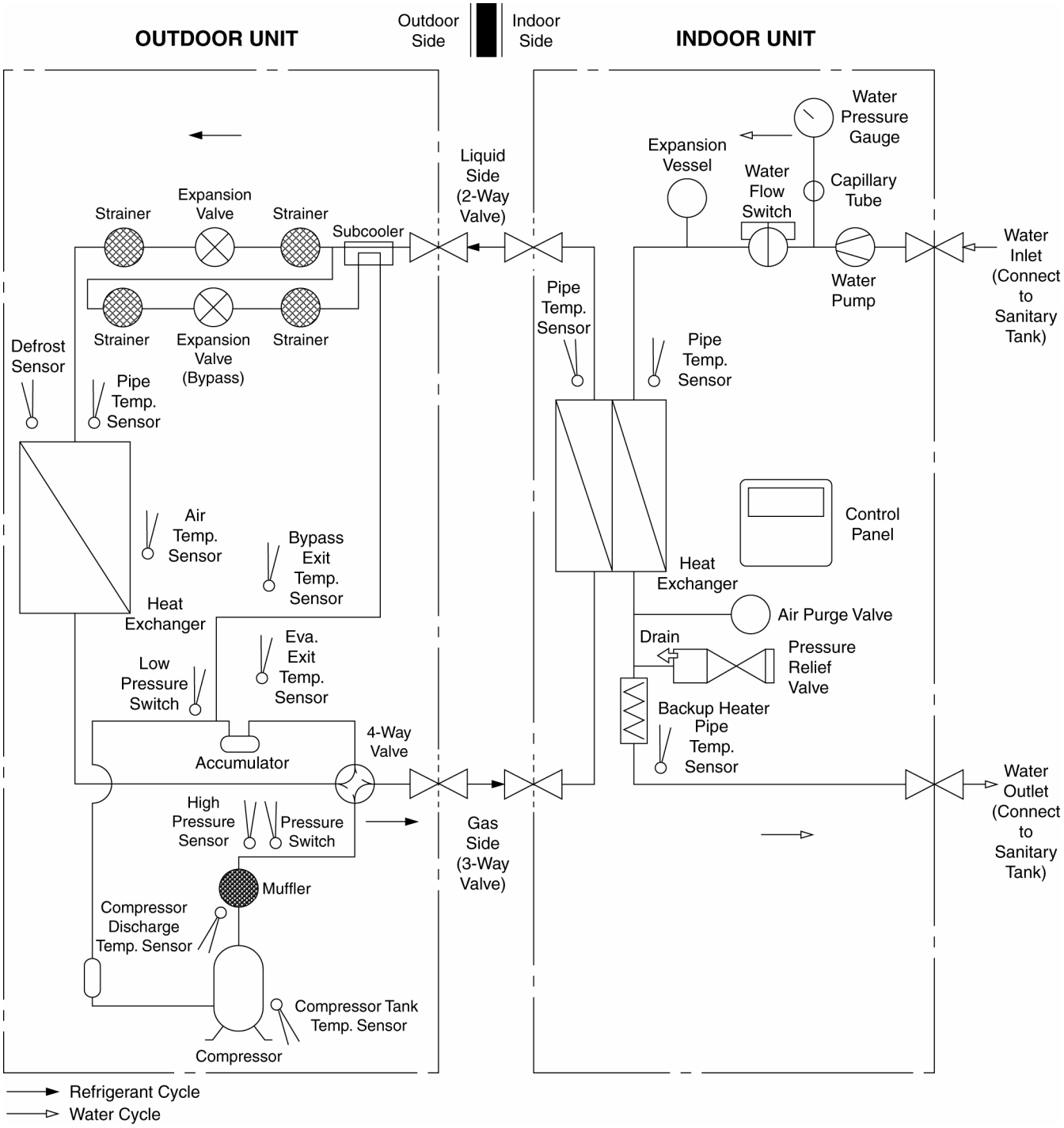



Unit: mm

## 5.2 Outdoor Unit

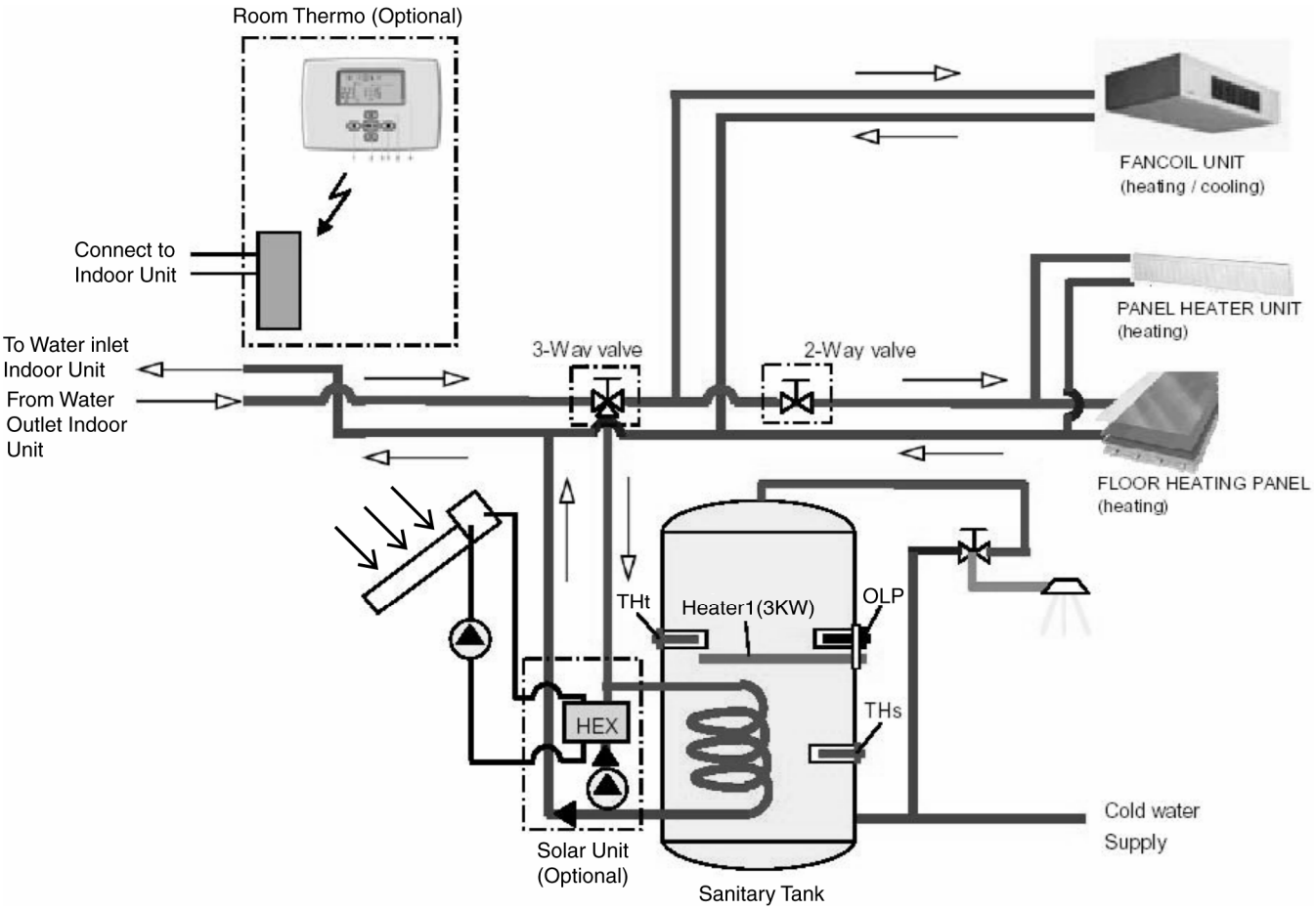


# 6. Refrigeration and Water Cycle Diagram

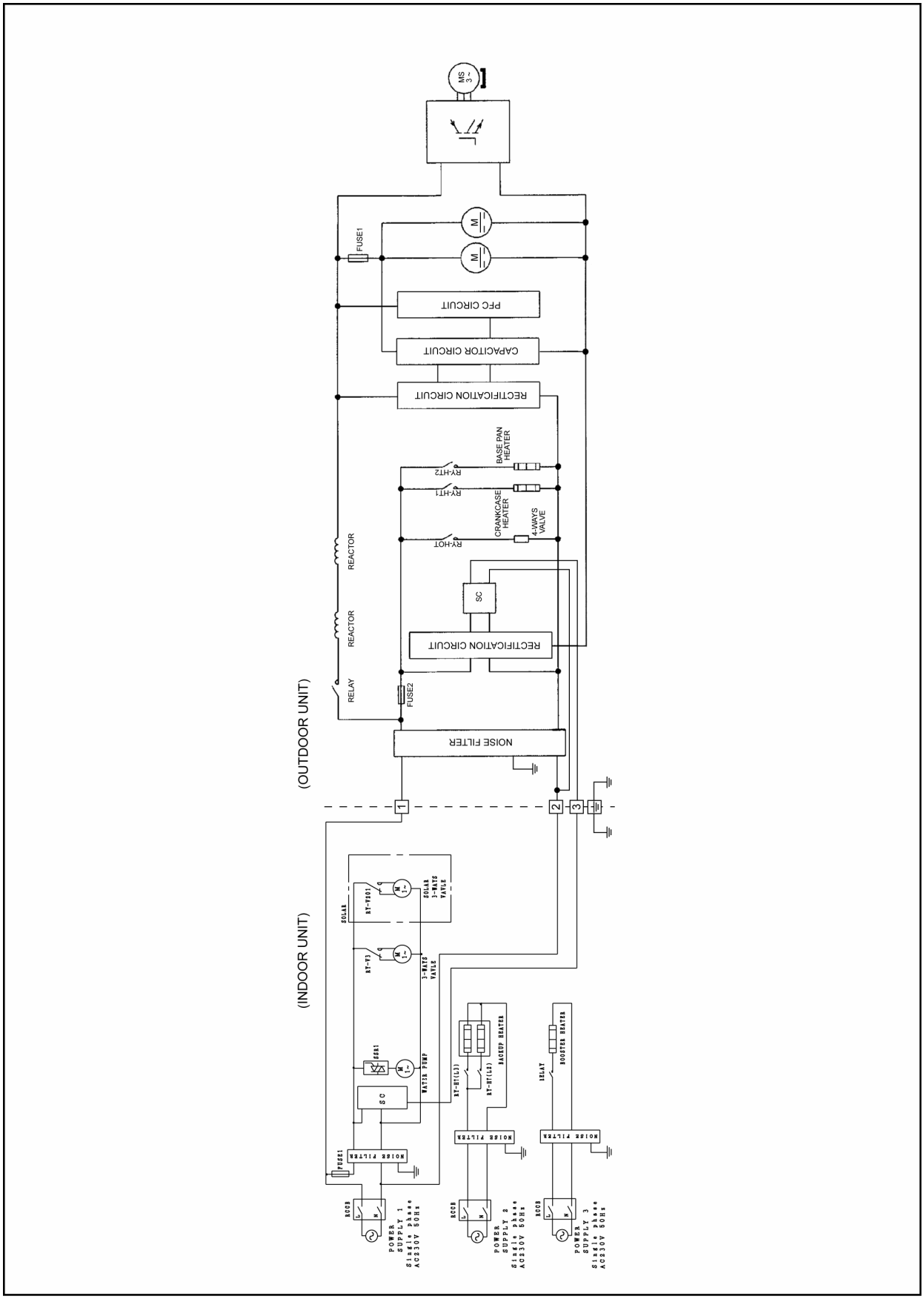



| Model | Piping size | | Rated Length (m) | Common Length (m) | Max Elevation (m) | Min. Piping Length (m) | Max. Piping Length (m) | Additional Refrigerant (g/m) |
|---|---|---|---|---|---|---|---|---|
| | Gas | Liquid | | | | | | |
| UH09DE5 | 5/8” | 3/8” | 7 | 15 | 20 | 3 | 30 | 70 |
| UH12DE5 | 5/8” | 3/8” | 7 | 15 | 20 | 3 | 30 | 70 |

* If piping length is over common length, additional refrigerant should be added as shown in the table.


Room Thermo (Optional)
Connect to
Indoor Unit
To Water inlet
Indoor Unit
From Water
Outlet Indoor
Unit
3-Way valve
2-Way valve
FANCOIL UNIT
(heating / cooling)
PANEL HEATER UNIT
(heating)
FLOOR HEATING PANEL
(heating)
THt
Heater1(3KW)
OLP
THs
HEX
Solar Unit
(Optional)
Sanitary Tank
Cold water
Supply

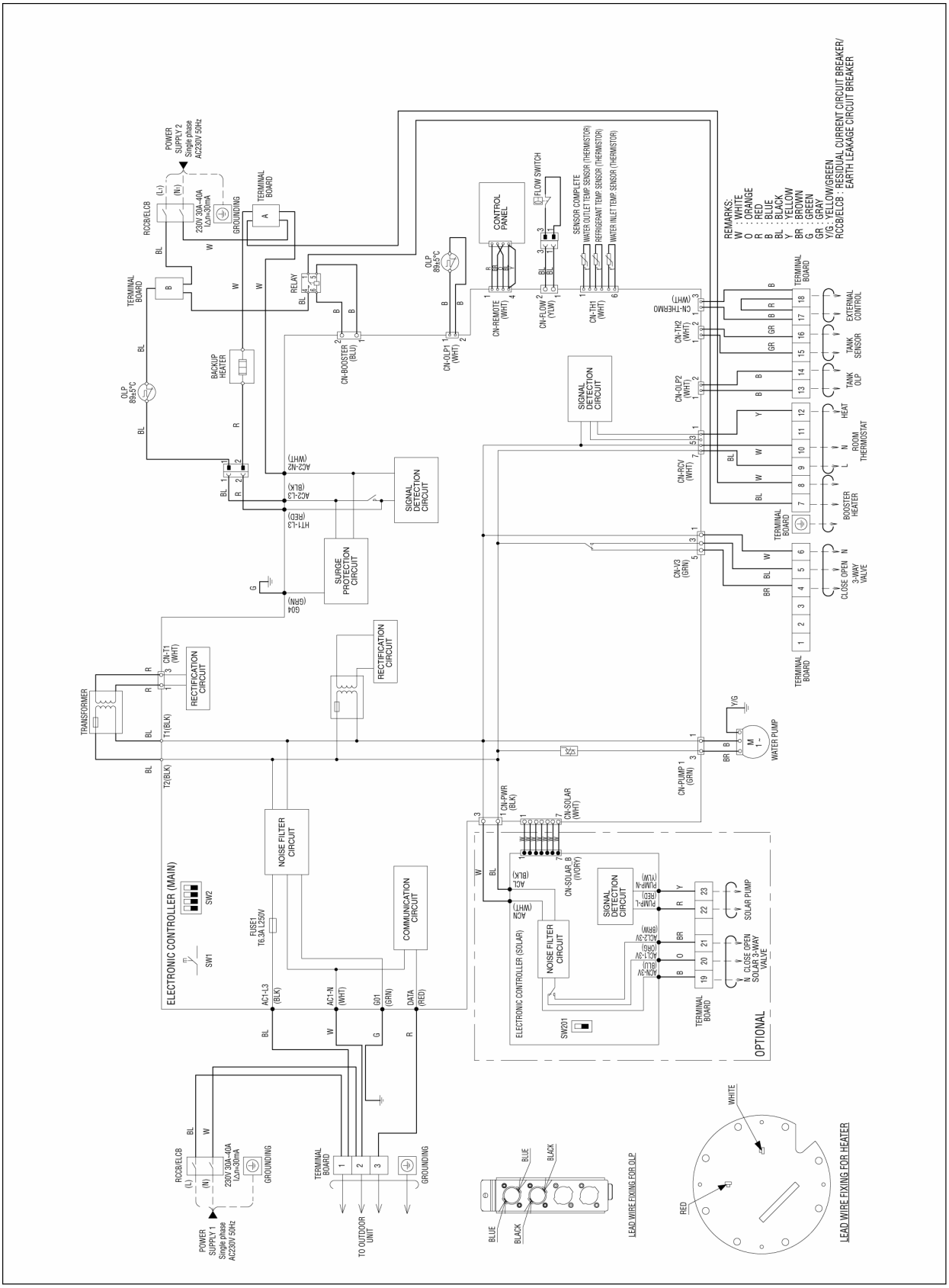
# 7. Block Diagram



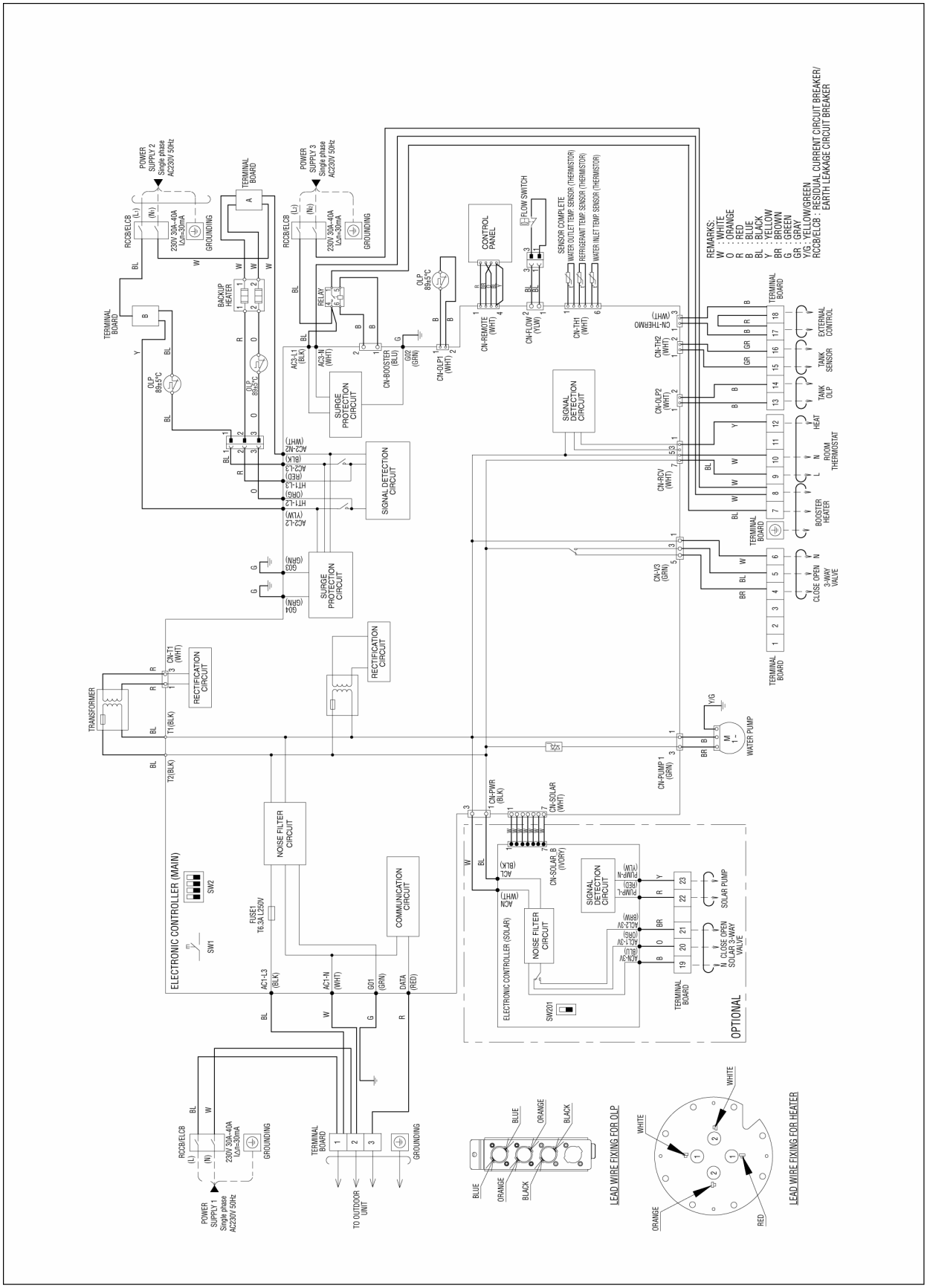
# 8. Wiring Connection Diagram

## *8.1 Indoor Unit*

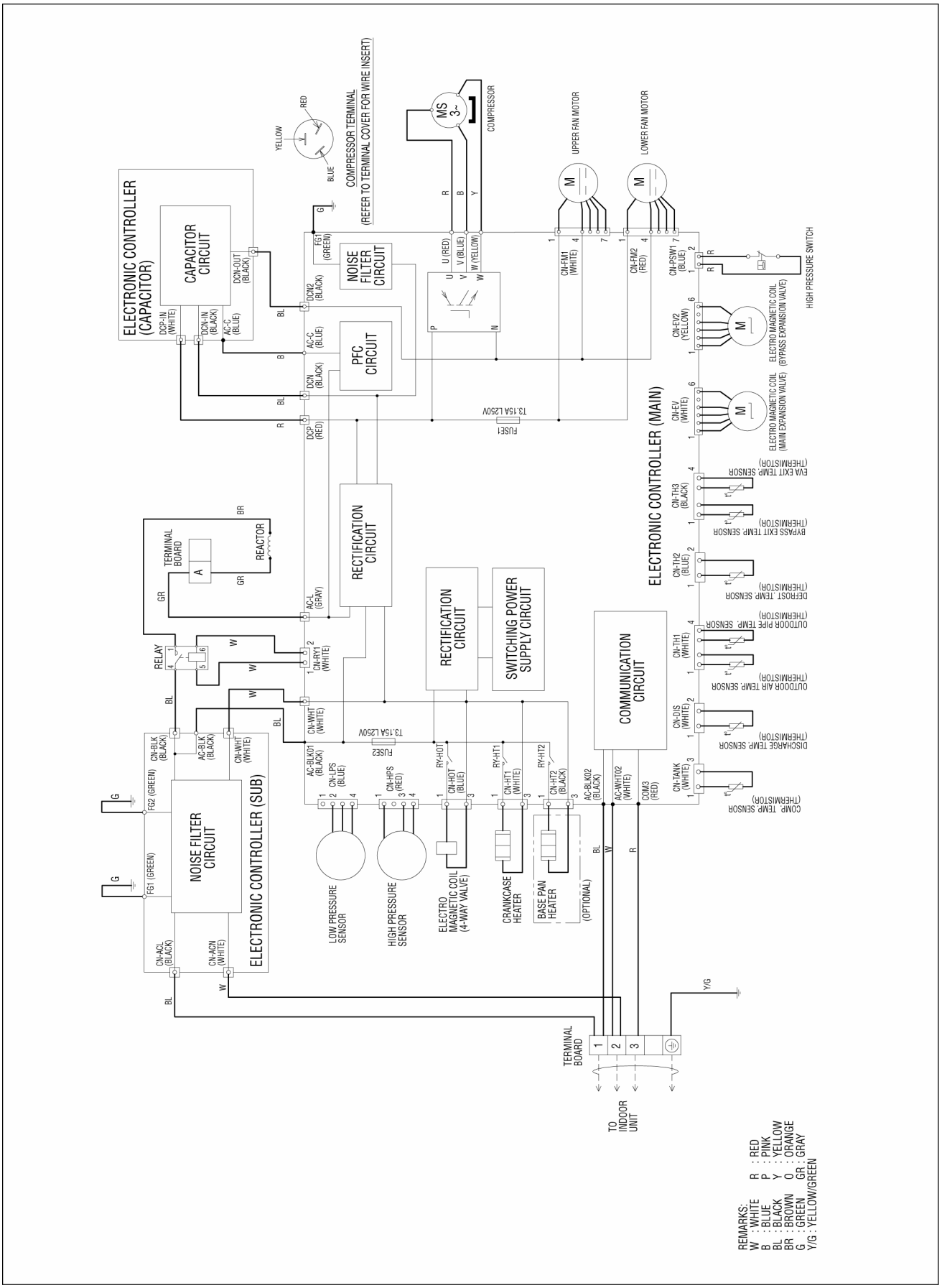
### 8.1.1 WH-SHF09D3E5



## 8.1.2 WH-SHF12D6E5



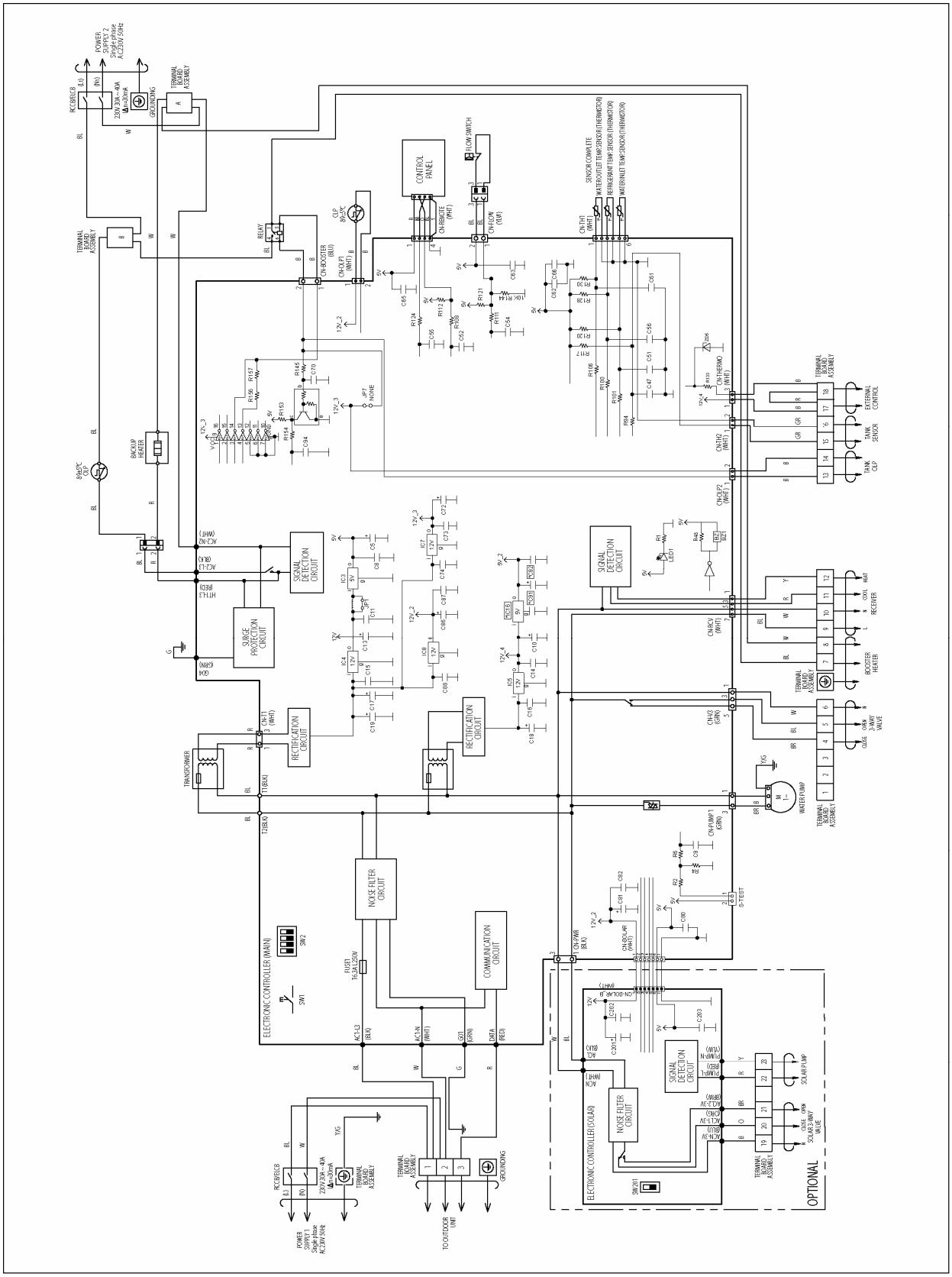
## 8.2 Outdoor Unit



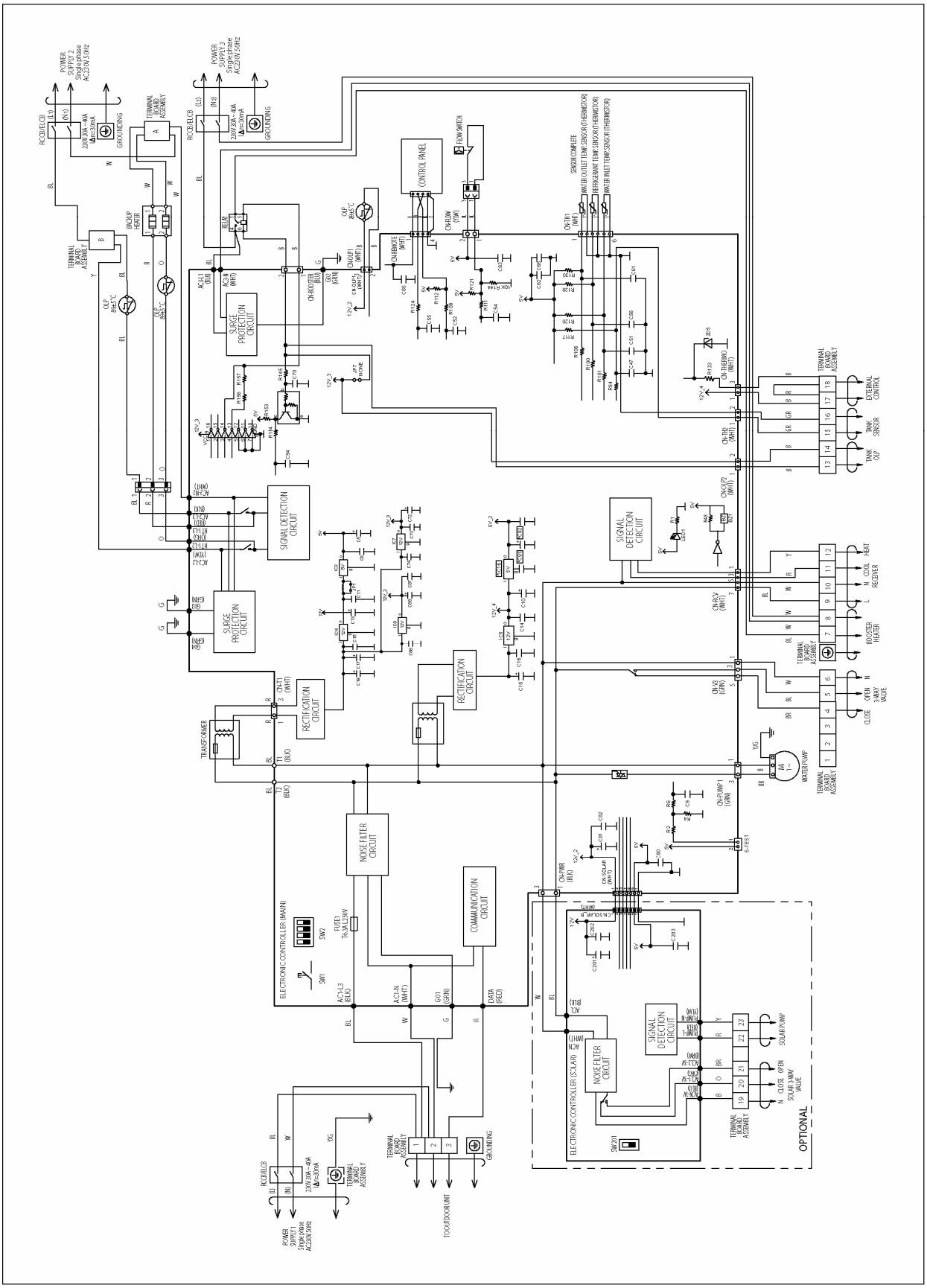
# 9. Electronic Circuit Diagram

## *9.1 Indoor Unit*

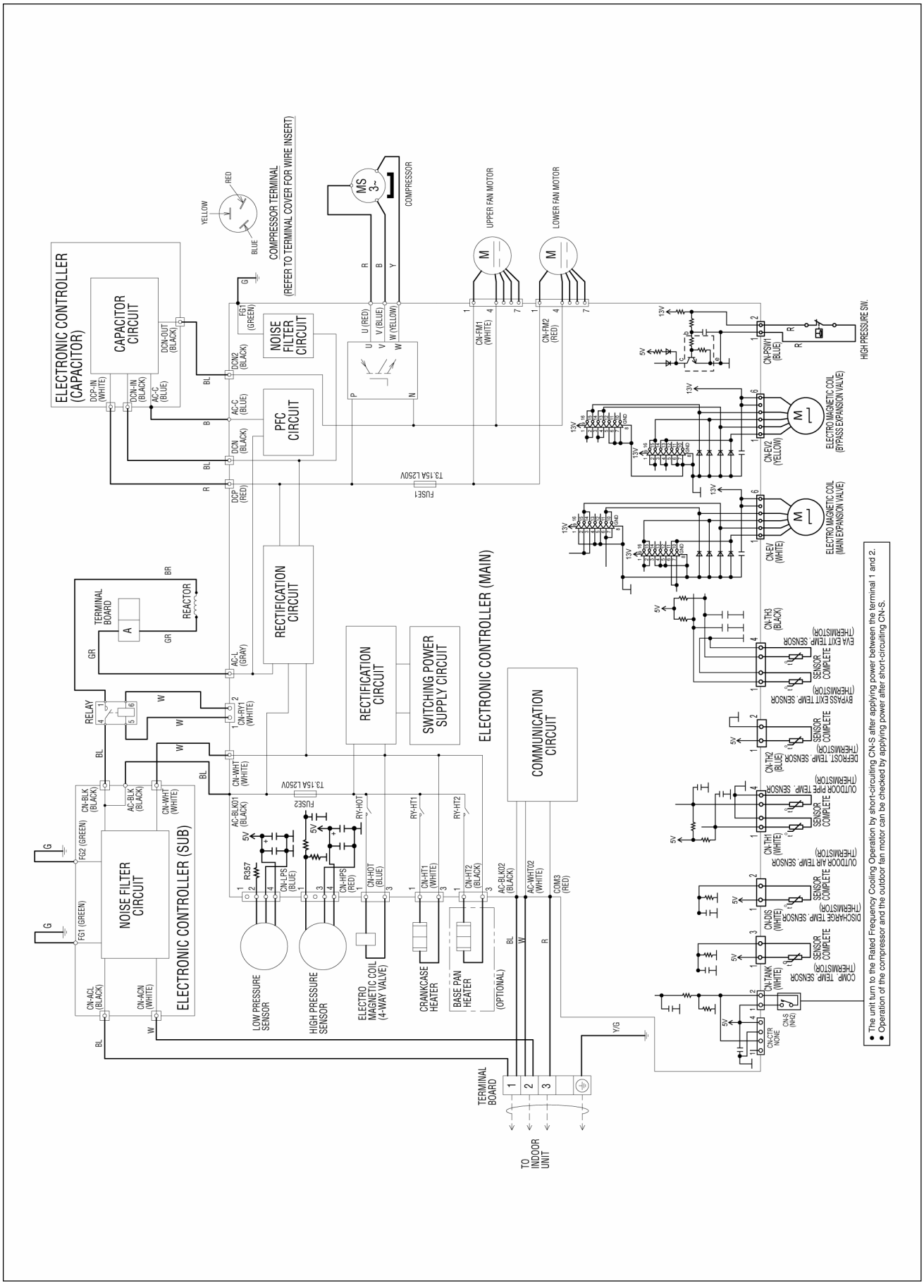
### 9.1.1 WH-SHF09D3E5



## 9.1.2 WH-SHF12D6E5



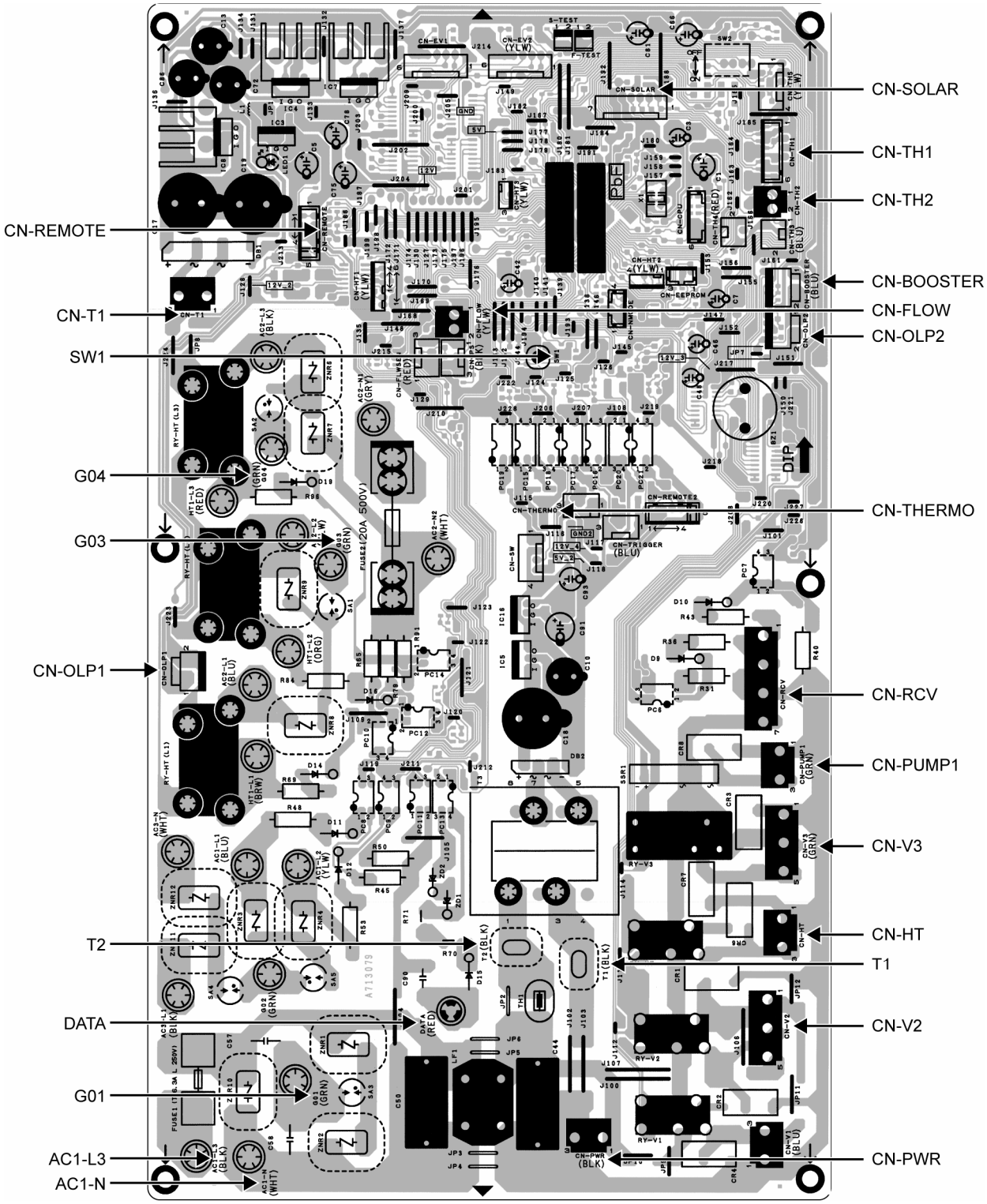
## 9.2 Outdoor Unit



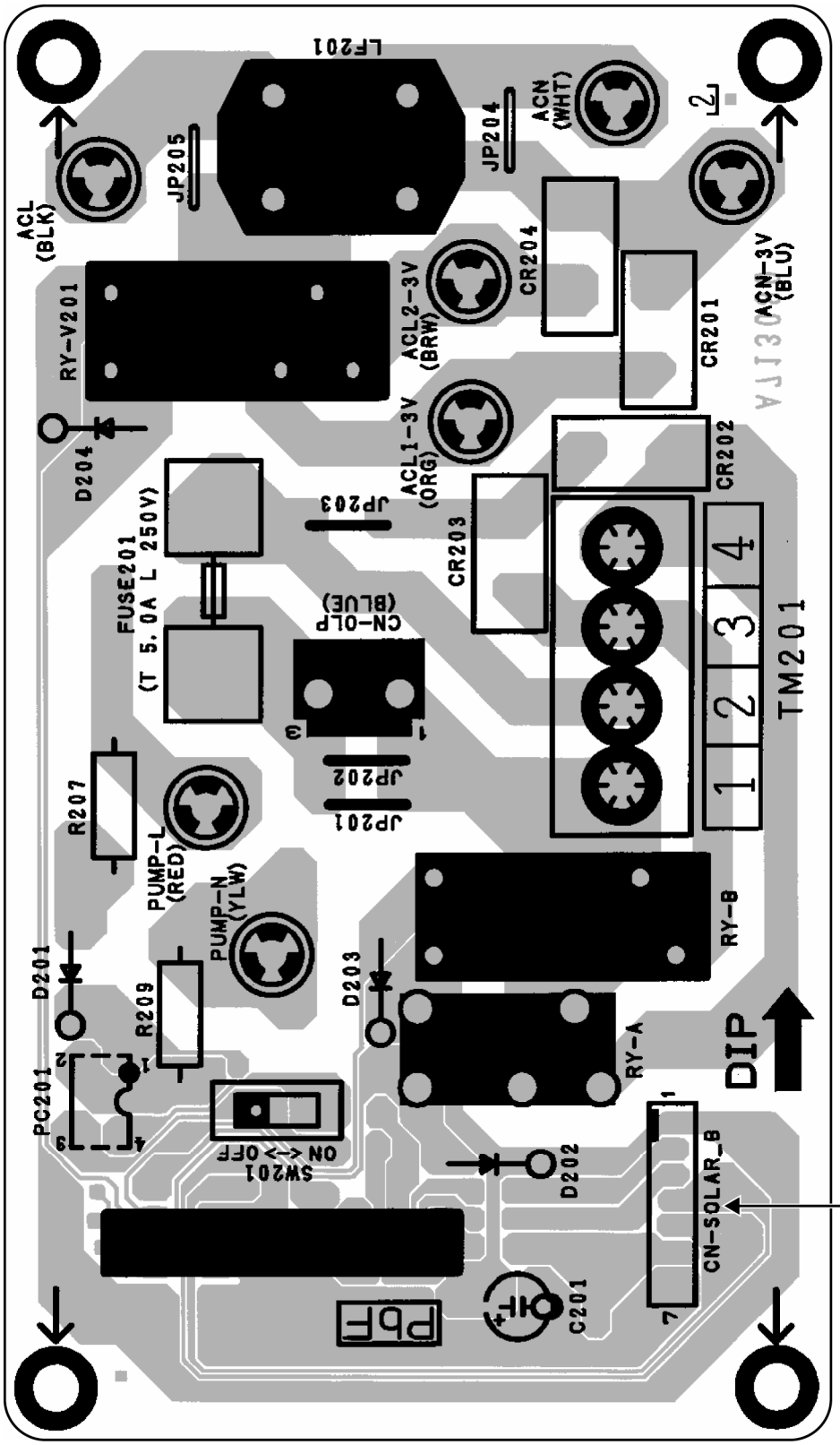
# 10. Printed Circuit Board

## *10.1 Indoor Unit*

### 10.1.1 Main Printed Circuit Board



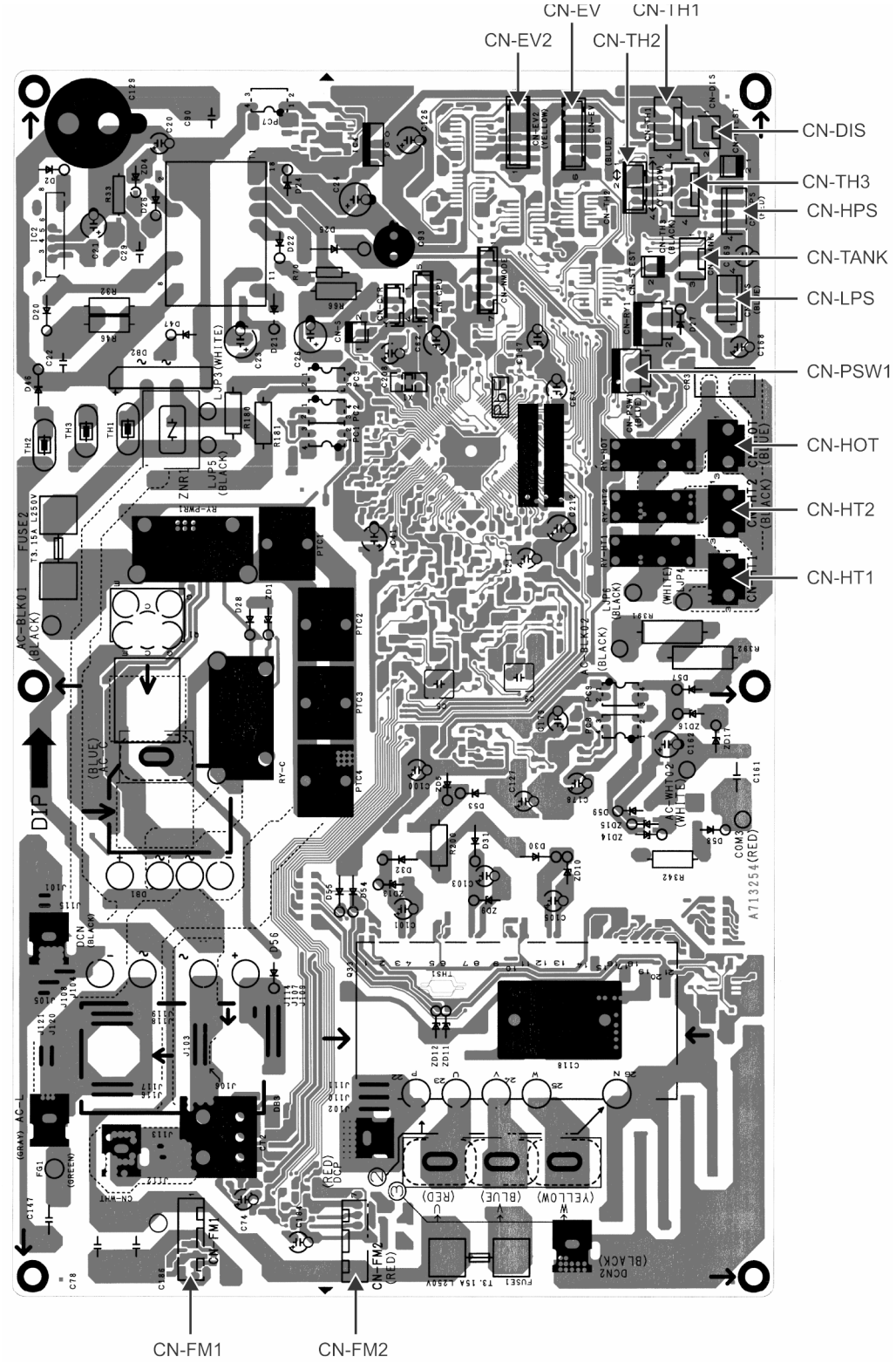
### 10.1.2 Solar Printed Circuit Board (Optional)



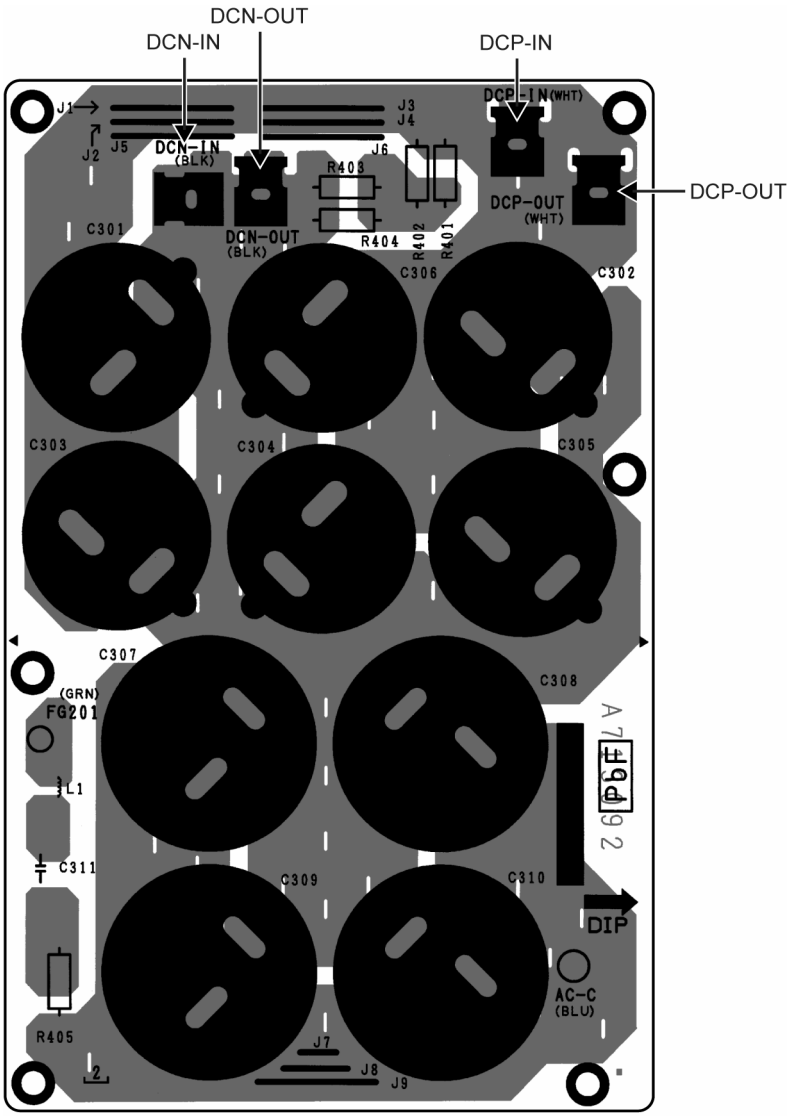

CN-SOLAR_B

## *10.2 Outdoor Unit*

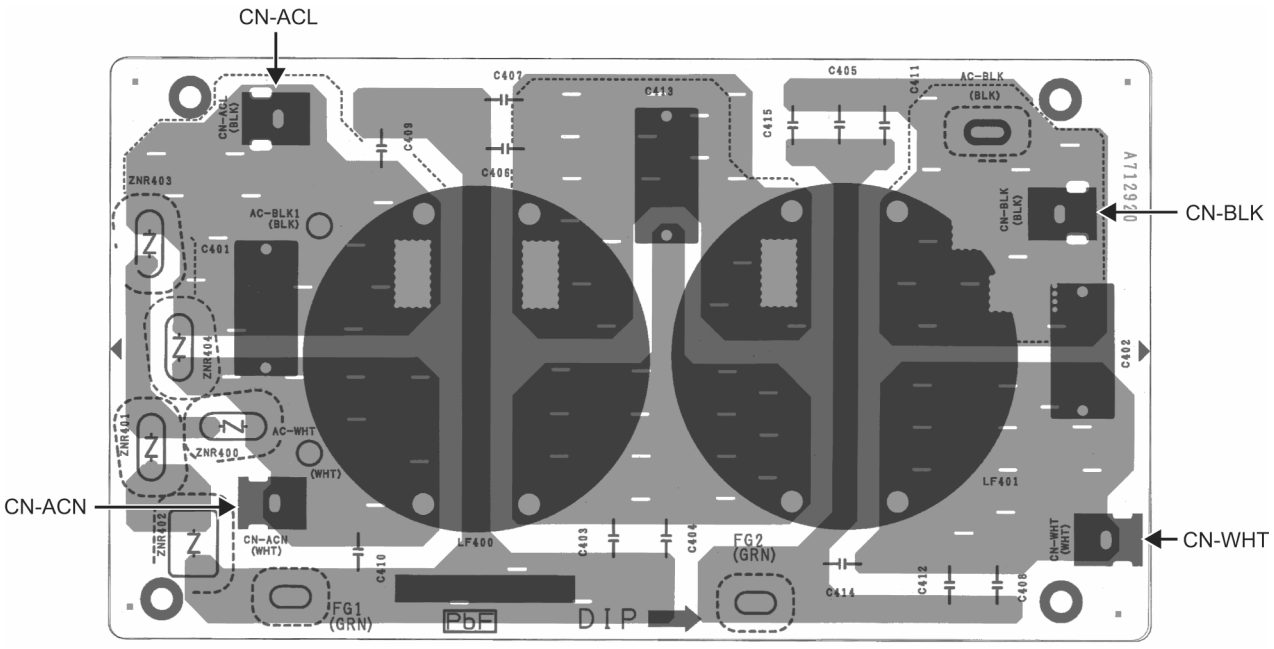
### 10.2.1 Main Printed Circuit Board



### 10.2.2 Capacitor Printed Circuit Board




### 10.2.3 Noise Filter Printed Circuit Board



# 11. Installation Instruction

## *11.1 Select the Best Location*

**Indoor Unit**

- There should not be any heat source or steam near the unit.
- A place where air circulation in the room is good.
- A place where drainage can be easily done.
- A place where noise prevention is taken into consideration.
- Do not install the unit near the door way.
- Ensure the spaces indicated by arrows from the wall, ceiling, fence or other obstacles.
- Recommended installation height for indoor unit shall be at least 800 mm.
- Must install on a vertical wall.
- When install electrical equipment at wooden building of metal lath or wire lath, according to electrical facility technical standard, no electrical contact between equipment and building is allowed. Insulator must be installed in between.
- Do not install the unit at outdoor. This is designed for indoor installation only.
- When connecting solar pump station cable between indoor unit and solar pump station, the distance between both apparatuses shall be 2 ~ 8 meters and the length of the said cable must be shorter than 10 meter.
- Fail to do so may lead to abnormal operation to the system.

**Outdoor Unit**

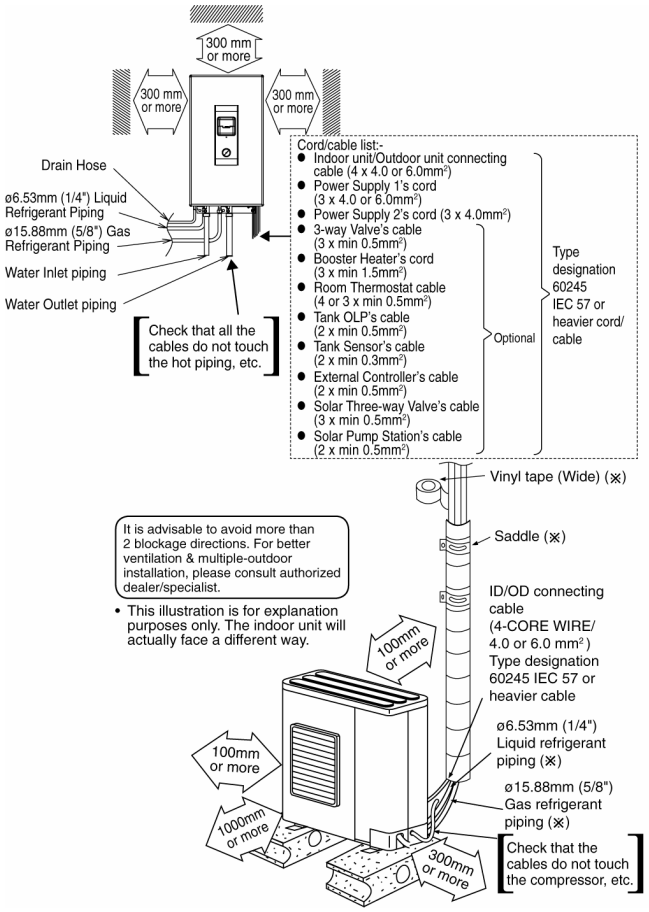
- If an awning is built over the unit to prevent direct sunlight or rain, be careful that heat radiation from the condenser is not obstructed.
- Avoid location where ambient temperature is below -20°C.
- Keep the spaces indicated by arrows from wall, ceiling, fence or other obstacles.
- Do not place any obstacles which may cause a short circuit of the discharged air.
- If outdoor unit installed near sea, region with high content of sulphur or oily location (e.g. machinary oil, etc), it lifespan maybe shorten.
- When installing the product in a place where it will be affected by typhoon or strong wind such as wind blowing between buildings, including the rooftop of a building and a place where there is no building in surroundings, fix the product with an overturn prevention wire, etc. (Overturn prevention fitting model number: K-KYZP15C)

- If piping length is over 15 m, additional refrigerant should be added as shown in the table.

| Model | Piping size | | Rated Length (m) | Max Elevation (m) | Min. Piping Length (m) | Max. Piping Length (m) | Additional Refrigerant (g/m) |
|---|---|---|---|---|---|---|---|
| | Gas | Liquid | | | | | |
| SHF09D3E5/ UH09DE5 | ø15.88 mm (5/8") | ø9.52 mm (3/8") | 5~7.5 | 20 | 3 | 30 | 70 |
| SHF12D6E5/ UH12DE5 | ø15.88 mm (5/8") | ø9.52 mm (3/8") | 5~7.5 | 20 | 3 | 30 | 70 |

Example : For SHF12D6E5/UH12DE5
If piping length is 30m, the quantity of additional refrigerant should be 1050g. [(30-15)m x 70 g/m = 1050g]

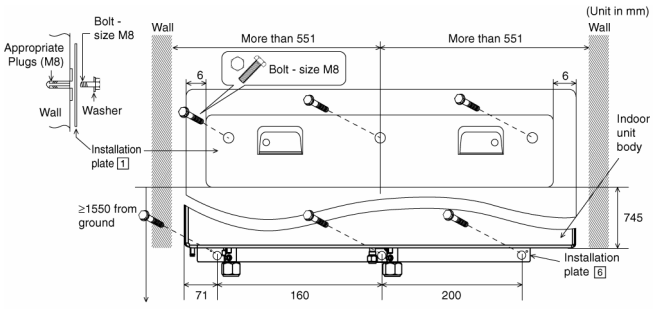
## *11.2 Indoor/Outdoor Unit Installation Diagram*



## 11.3 Indoor Unit

### 11.3.1 How to Fix Installation Plate

The mounting wall is strong and solid enough to prevent it from vibration.




The centre of installation plate should be at more than 551 mm at right and left of the wall.
The distance from installation plate edge to ground should more than 1550 mm.

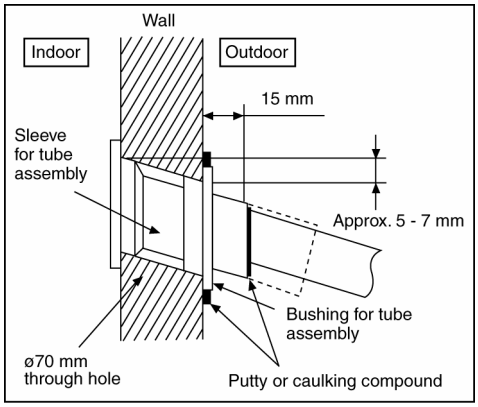
- Always mount the installation plate horizontally by aligning the marking thread and using a level gauge.
- Mount the installation plate on the wall with 6 sets of plug, bolt and washer (all non-supply) with size M8.

### 11.3.2 To Drill a Hole in the Wall and Install a Sleeve of Piping

1 Insert the piping sleeve to the hole.
2 Fix the bushing to the sleeve.
3 Cut the sleeve until it extrudes about 15 mm from the wall.

| ⚠ CAUTION |
|---|
| When the wall is hollow, please be sure to use the sleeve for tube assembly to prevent dangers caused by mice biting the connecting cable. |

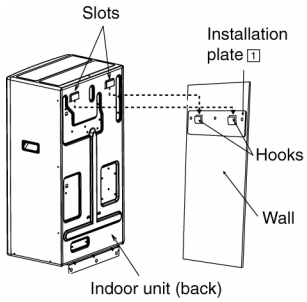
4 Finish by sealing the sleeve with putty or caulking compound at the final stage.

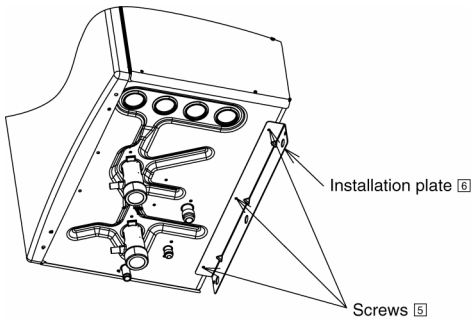



### 11.3.3 Indoor Unit Installation

#### *11.3.3.1 Install the Indoor Unit*

1 When connecting solar pump station cable between indoor unit and solar pump station, the distance between both apparatuses shall be 2 ~ 8 meters and the length of the said cable must be shorter than 10 meter. Fail to do so may lead to abnormal operation to the system.
2 Engage the slots on the indoor unit to the hooks of installation plate 1. Ensure the hooks are properly seated on the installation plate by moving it left and right.
3 Fix the screws 5 to the holes on the hooks of installation plate, 6 as illustrated below.




#### *11.3.3.2 Water Piping Installation*

- The minimum requirement of water in the system is 50 litres. If this value could not be achieved, please install additional buffer tank (field supply).
- Water inlet and water outlet in indoor unit are used for connection to water circuit. Please request a licensed technician to install this water circuit.
- This water circuit must comply with all relevant European and national regulations, i.e. IEC/EN 61770.
- Be careful not to deform the piping with excessive force when doing piping connection job.
- Use Rp 1¼" nut for both water inlet and outlet connection and clean all pipings with tap water before install.
- Cover the pipe end to prevent dirt and dust when inserting it through a wall.
- Choose proper sealer which can withstand the pressures and temperatures of the system.
- If existing tank is to be connected to this indoor/outdoor unit, ensure the pipes are clean before water pipe installation is carries out.

- Install external filter (30 mesh or more, field supply) before water inlet of indoor unit (with “WATER IN” indication).
- Refer to Diagram 4.1 for pipe connection of Panel Heater, Floor Heater, Tank Unit, Solar Pump Station, 3-way Valve Kit and etc. Fail to connect the pipes appropriately might cause the unit malfunction.

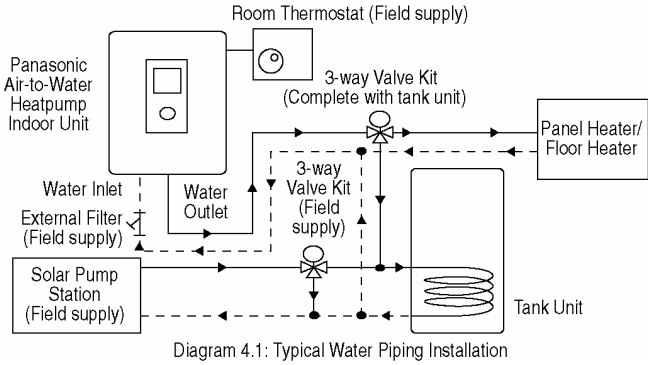
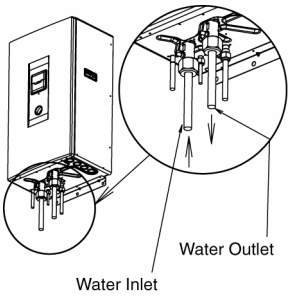


Diagram 4.1: Typical Water Piping Installation

- Be sure to use two spanners to tighten the connection. Further tighten the nuts with torque wrench in specified torque as stated in the table.
- If non-brass metallic piping is used for installation, make sure to insulate the pipes to prevent galvanic corrosion.
- Make sure to insulate the water circuit pipes to prevent reduction of heating capacity.
- After installation, check the water leakage condition in connection area during test run.




| Model | Nut size (Torque) |
|---|---|
| | Water |
| (SHF09D3E5/UH09DE5, SHF12D6E5/UH12DE5) | Rp 1 1/4” [117.6 N•m] |

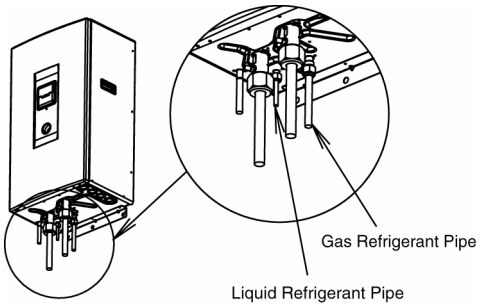
| ⚠ CAUTION |
|---|
| Do not over tighten, over tightening cause gas leakage. |

### *11.3.3.3 Indoor Unit Refrigerant Pipe Installation*

1 Please make flare after inserting flare nut (located at joint portion of tube assembly) onto the copper pipe. (In case of using long piping)
2 Do not use pipe wrench to open refrigerant piping. Flare nut may be broken and cause leakage. Use proper spanner or ring wrench.
3 Connect the piping:
   - Align the center of piping and sufficiently tighten the flare nut with fingers.
   - Further tighten the flare nut with torque wrench in specified torque as stated in the table.

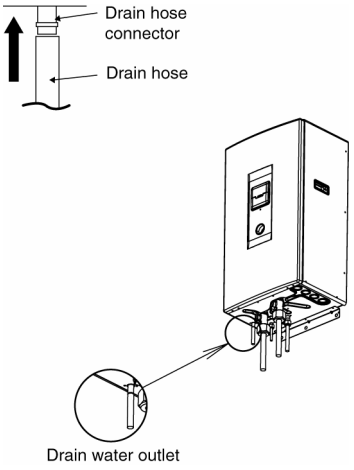
| Model | Piping size (Torque) | |
|---|---|---|
| | Gas | Liquid |
| SHF09D3E5/UH09DE5, SHF12D6E5/UH12DE5 | ø15.88mm (5/8”) [65 N•m] | ø 9.52mm (3/8”) [42 N•m] |

| ⚠ CAUTION |
|---|
| Do not over tighten, over tightening cause gas leakage. |




### *11.3.3.4 Drain Hose Installation*

- Use inner diameter 15 mm drain hose in the market.
- This hose must to be installed in a continuously downward direction and in a frost-free environment.
- Do not insert this hose into sewage hose or cleaning hose that may generate ammonia gas, sulfuric gas, etc.
- If necessary, use hose clamp to further tighten the hose at drain hose connector to prevent leakage.
- The water may drip from drain hose. Therefore must ensure the outlet of the hose is always not closed or blocked.

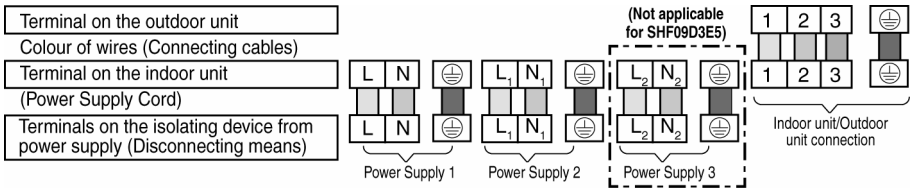


## 11.3.4 Connect the Cable to the Indoor Unit

1 Connecting cable between indoor unit and outdoor unit shall be approved polychloroprene sheathed 4 x 4.0 or 6.0 $mm^2$ flexible cord, type designation 60245 IEC 57 or heavier cord.
   - o Ensure the colour of wires of outdoor unit and the terminal Nos. are the same to the indoor unit's respectively.
   - o Earth wire shall be longer than the other wires as shown in the figure for the electrical safety in case of the slipping out of the cord from the Holder (Clamper).

2 Cable connection to the power supply through isolating device (Disconnecting means).
   - o Isolating device (Disconnecting means) should have minimum 3.0 mm contact gap.
   - o Connect the approved polychloroprene sheathed power supply 1 cord (3 x 4.0 or 6 $mm^2$) and power supply 2 cord (3 x 4.0 $mm^2$) and power supply 3 cord (3 x 1.5 $mm^2$) (Not applicable for SHF09D3E5), type designation 60245 IEC 57 or heavier cord to the terminal board, and to the other end of the cord to isolating device (Disconnecting means).

3 To avoid cable and cord harmed by sharp edge, cable and cord must go through bushing (located at the bottom of indoor unit) before carry out electrical connection. The bushing must be used and must not take off.




**Connecting with external device (optional)**

1 **All connections shall** follow to the local national wiring standard.

2 It is strongly recommended to use manufacturer-recommended parts and accessories for installation.

3 Maximum output power of booster heater shall be ≤ 3kW. Booster Heater' s cord must be (3 x min 1.5 $mm^2$), of type designation 60245 IEC 57 or heavier.

4 Three-Way Valve shall be spring and electronic type. Valve's cable shall be (3 x min 0.5 $mm^2$), of type designation 60245 IEC 57 or heavier, or similarly double insulation sheathed cable.
   * note: - Should be CE marking compliance component.
   - It shall be directed to heating mode when it is OFF.
   - Maximum load for the valve is 3VA.

5 Room Thermostat cable must be (4 or 3 x min 0.5 $mm^2$), double insulation layer of PVC-sheathed or rubber-sheathed cable.

6 Tank OLP cable must be (2 x min 0.5 $mm^2$), double insulation layer of PVC-sheathed or rubber-sheathed cable.
   * note: if such connection deemed NO necessary for tank OLP, please connect jumper between terminal no. 13 and 14.

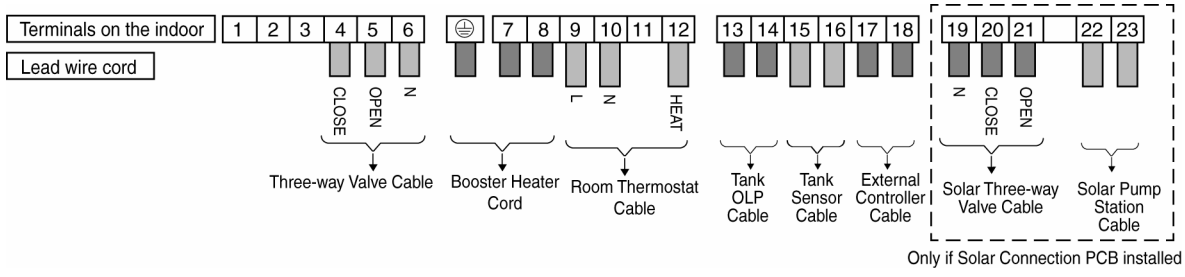
7 Tank Sensor shall be resistance type, please refer to Graph 5.1 for the characteristic and details of sensor. Its cable shall be (2 x min 0.3 $mm^2$), double insulation layer (with insulation strength of min 30V) of PVC-sheathed or rubber-sheathed cable.

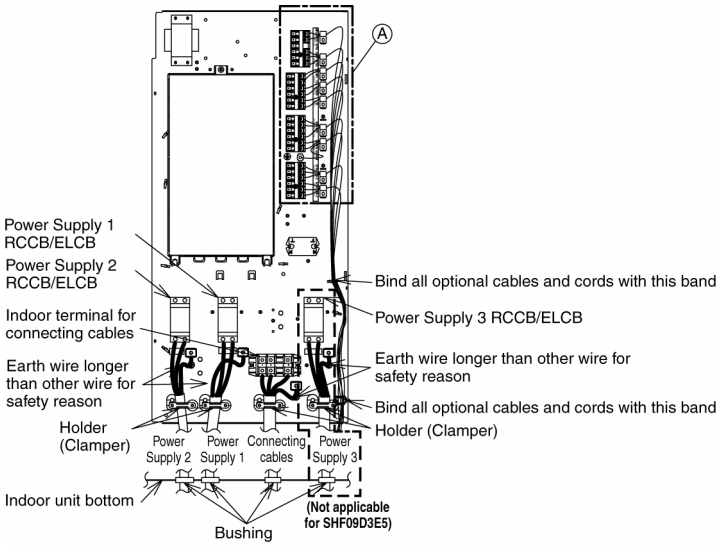
8 External Controller shall be connected to 1-pole switch with min 3.0 mm contact gap. (connection refer to Diagram 5.2). Its cable must be (2 x min 0.5 $mm^2$), double insulation layer of PVC-sheathed or rubber-sheathed cable.
   * note: - When making such connection, kindly remove the jumper between terminal no. 17 and 18.
   - Switch used shall be CE marking compliance component.
   - Maximum operating current shall be less than $3A_{rms}$.

9 Must install Solar Connection PCB [8] (optional) to indoor unit when Solar Pump Station is utilized. Refer Solar Connection PCB installation instruction for detail of installation.

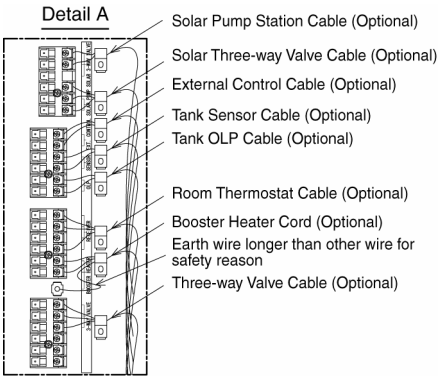
10 Solar Three-way Valve cable shall be (3 x min 0.5 $mm^2$), double insulation layer PVC-sheathed or rubber-sheathed cable.

11 Solar Pump Station cable shall be (2 x min 0.5 $mm^2$), of double insulation PVC-sheathed or rubber-sheathed cable. Strongly recommended install with maximum length of 10 meter only.



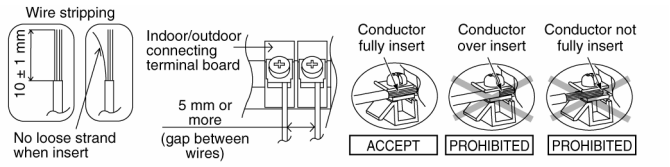


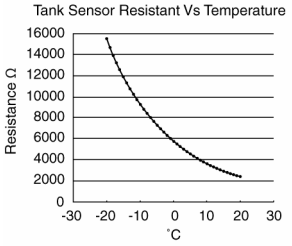

How to guide the lead wires and power supply cord
(view without internal wiring)




| Terminal screw | Tightening torque N•cm {kgf•cm} |
|---|---|
| M4 | 157~196 {16~20} |
| M5 | 196~245 {20~25} |

## *11.3.4.1 Wire Stripping and Connecting Requirement*




Graph 5.1: Tank sensor characteristic

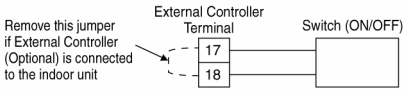



Diagram 5.2: External Controller connecting diagram

### *11.3.4.2 Connecting Requirement*

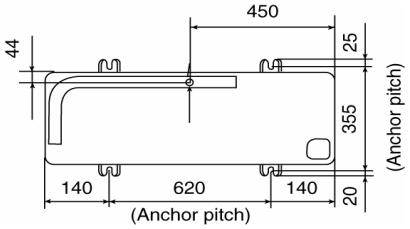
- The equipment's power supply 1 complies with IEC/EN 61000-3-12 provided that the short-circuit power $S_{sc}$ is greater than or equal to 1700.31kW (for SHF09D3E5/UH09DE5 and SHF12D6E5/UH12DE5) at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short-circuit power $S_{sc}$ greater than or equal to 1700.31kW.
- The equipment's power supply 1 shall be connected to a suitable supply network, having service current capacity ≥100A per phase. Please liaise with supply authority to ensure that the service current capacity at the interface point is sufficient for the installation of the equipment.
- The equipment's power supply 2 complies with IEC/EN 61000-3-12.
- The equipment's power supply 2 shall be connected to a suitable supply network, with the following maximum permissible system impedance $Z_{max}$ at the interface for models:
  SHF09D3E5/UH09DE5 and SHF12D6E5/UH12DE5 : 0.236 Ω
  Please liaise with supply authority to ensure that the power supply 2 is connected only to a supply of that impedance or less.
- The equipment's power supply 3 complies with IEC/EN 61000-3-12.
- The equipment's power supply 3 shall be connected to a suitable supply network, with the following maximum permissible system impedance $Z_{max}$ at the interface for models:
  SHF09D3E5/UH09DE5 and SHF12D6E5/UH12DE5 : 0.464 Ω
  Please liaise with supply authority to ensure that the power supply 3 is connected only to a supply of that impedance or less.

## *11.4 Outdoor Unit*

### 11.4.1 Install the Outdoor Unit

- After selecting the best location, start installation according to Indoor/Outdoor Unit Installation Diagram.
  1 Fix the unit on concrete or rigid frame firmly and horizontally by bolt nut (ø10mm).
  2 When installing at roof, please consider strong wind and earthquake. Please fasten the installation stand firmly with bolt or nails.

  (Unit in mm)




### 11.4.2 Connecting the Piping

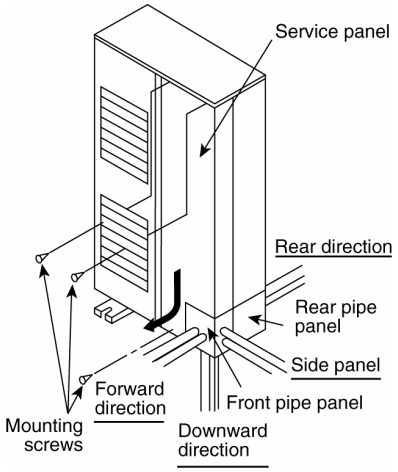
| Model | Piping size (Torque) | |
|---|---|---|
| | Gas | Liquid |
| SHF09D3E5/UH09DE5, SHF12D6E5/UH12DE5 | ø15.88mm (5/8") [65 N•m] | ø9.52mm (3/8") [42 N•m] |

| ⚠ CAUTION |
|---|
| Do not over tighten, over tightening cause gas leakage. |

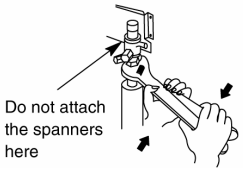
**Connecting the Piping to Outdoor Unit**
Decide piping length and then cut by using pipe cutter. Remove burrs from cut edge. Make flare after inserting the flare nut (locate at valve) onto the copper pipe.
Align center of piping to valves and then tighten with torque wrench to the specified torque as stated in the table.

Local pipes can project in any of four directions.
- Make holes in the pipe panels for the pipes to pass through.
- Be sure to install the pipe panels to prevent rain from getting inside the outdoor unit.

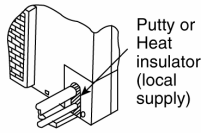
[Removing the service panel].
(1) Remove the three mounting screws.
(2) Slide the service panel downward to release the pawls.
After this, pull the service panel toward you to remove it.



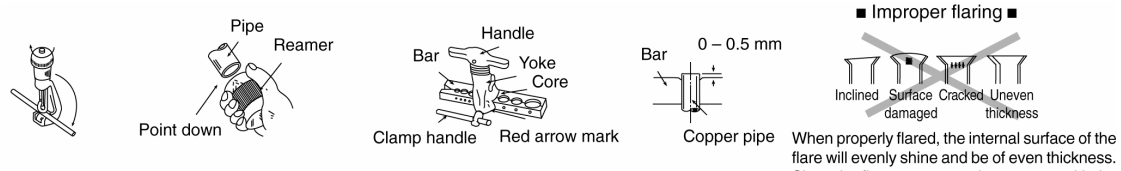

Be sure to use two spanners to tighten. (If the nuts are overtightened, it may cause the flares to break or leak.)




Close the tube joining area with putty heat insulator (local supply) without any gap as shown in right figure. (To prevent insects or small animal entering.)




**Cutting and Flaring the Piping**
1 Please cut using pipe cutter and then remove the burrs.
2 Remove the burrs by using reamer. If burrs is not removed, gas leakage may be caused. Turn the piping end down to avoid the metal powder entering the pipe.
3 Please make flare after inserting the flare nut onto the copper pipes.

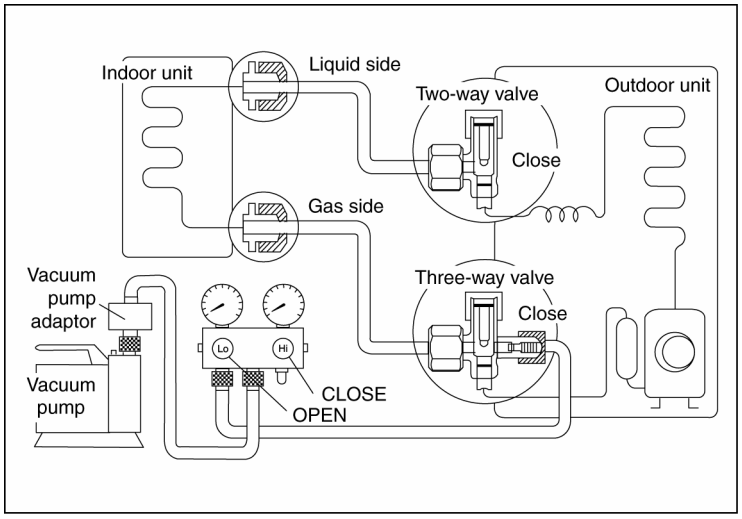



1. To cut
2. To remove burrs
3. To flare

When properly flared, the internal surface of the flare will evenly shine and be of even thickness. Since the flare part comes into contact with the connections, carefully check the flare finish.

## 11.4.3 Evacuation of the Equipment

WHEN INSTALLING AN AIR-TO-WATER HEATPUMP, BE SURE TO EVACUATE THE AIR INSIDE THE INDOOR UNIT AND PIPES in the following procedure.




1 Connect a charging hose with a push pin to the Low side of a charging set and the service port of the 3-way valve.
   - Be sure to connect the end of the charging hose with the push pin to the service port.
2 Connect the center hose of the charging set to a vacuum pump with check valve, or vacuum pump and vacuum pump adaptor.
3 Turn on the power switch of the vacuum pump and make sure that the needle in the gauge moves from 0cmHg (0 MPa) to –76cmHg (–0.1 MPa). Then evacuate the air approximately ten minutes.
4 Close the Low side valve of the charging set and turn off the vacuum pump. Make sure that the needle in the gauge does not move after approximately five minutes.
   Note: BE SURE TO FOLLOW THIS PROCEDURE IN ORDER TO AVOID REFRIGERANT GAS LEAKAGE.
5 Disconnect the charging hose from the vacuum pump and from the service port of the 3-way valve.
6 Tighten the service port caps of the 3-way valve at a torque of 18N•m with a torque wrench.
7 Remove the valve caps of both of the 2-way valve and 3-way valve. Position both of the valves to “OPEN” using a hexagonal wrench (4mm).
8 Mount valve caps onto the 2-way valve and the 3-way valve.
   - Be sure to check for gas leakage.

| ⚠ CAUTION |
|---|
| Do not add or replace other than R407C type. It may cause product damage, burst, injury and etc. Use compatible R410A tools for refrigerant piping work and refrigerant charging during installation or servicing. |

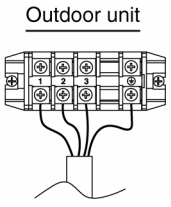
| ⚠ CAUTION |
|---|
| If gauge needle does not move from 0cmHg (0MPa) to –76cmHg (–0.1MPa), in step ③ above take the following measure:<br>• If the leak stops when the piping connections are tightened further, continue working from step ③.<br>• If the leak does not stop when the connections are retightened, repair the location of leak.<br>• Do not release refrigerant during piping work for installation and reinstallation. Take care of the liquid refrigerant, it may cause frostbite. |

## 11.4.4 Connect the Cable to the Outdoor Unit

(FOR DETAIL REFER TO WIRING DIAGRAM AT UNIT)

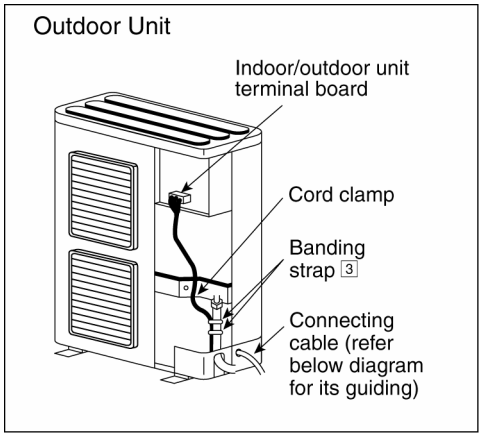
1 Remove the control board cover from the unit by loosening the screw.
2 Connecting cable between indoor unit and outdoor unit shall be approved polychloroprene sheathed 4 x (4.0 or 6.0 $mm^2$) flexible cord, type designation 60245 IEC 57 or heavier cord.

| Terminals on the indoor unit | 1 | 2 | 3 |
|---|---|---|---|
| Colour of wires | | | |
| Terminals on the outdoor unit | 1 | 2 | 3 |



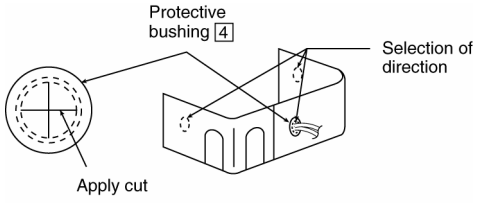

3 Secure the cable onto the control board with the holder (clamper).

4 Select required direction and apply protective bushing provided in accessories to protect cables from sharp edges.
5 Once all wiring work has been completed, tie the cables and cord together with the binding strap so that they do not touch other parts such as the compressor and bare copper pipes.
6 Install back the control board cover.




### *11.4.4.1 Wire Stripping and Connecting Requirement*

Same as indoor requirement. For details please refer the diagram on AIR-TO-WATER HEATPUMP INDOOR UNIT, section 11.3.4 (CONNECT THE CABLE TO THE INDOOR UNIT).



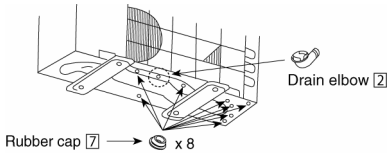

DETAIL OF CONNECTING CABLE GUIDING

## 11.4.5 Pipe Insulation

1 Please carry out insulation at pipe connection portion as mentioned in Indoor/Outdoor Unit Installation Diagram. Please wrap the insulated piping end to prevent water from going inside the piping.
2 If drain hose or connecting piping is in the room (where dew may form), please increase the insulation by using POLY-E FOAM with thickness 6 mm or above.

## 11.4.6 Disposal of Outdoor Unit Drain Water

- When a Drain elbow 2 is used, please ensure to follow below:
  - the unit should be placed on a stand which is taller than 50 mm.
  - cover the 8 holes (ø20mm) with Rubber cap 7 (refer to illustration below.)




- If the unit is used in an area where temperature falls below 0°C for 2 or 3 consecutive days, it is recommended not to use the Drain elbow 2 and Rubber cap 7 for the drain water freezes and the fan will not rotate.

# 12. Operation and Control

## *12.1 Basic Function*

Inverter control, which equipped with a microcomputer in determining the most suitable operating mode as time passes, automatically adjusts output power for maximum comfort always. In order to achieve the suitable operating mode, the microcomputer maintains the set temperature by measuring the temperature of the environment and performing temperature shifting. The compressor at outdoor unit is operating following the frequency instructed by the microcomputer at indoor unit that judging the condition according to internal water setting temperature and water outlet temperature.

### 12.1.1 Internal Water Setting Temperature

Once the operation starts, control panel setting temperature will be taken as base value for temperature shifting processes. These shifting processes are depending on the Air-to-Water Heatpump settings and the operation environment. The final shifted value will be used as internal water setting temperature and it is updated continuously whenever the electrical power is supplied to the unit.

### 12.1.2 Heating Operation

#### *12.1.2.1 Thermostat control*

- Compressor is OFF when Water Outlet Temperature - Internal Water Setting Temperature > 2°C for continuously 3 minutes.
- Compressor is ON after waiting for 3 minutes, if the Water Outlet Temperature - Water Inlet Temperature (temperature at thermostat OFF is triggered) < -3°C.

### 12.1.3 Tank Mode Operation

**Control contents:**

- 3 ways valve direction
  - 3 ways valve switch and fix to tank side.

- Heat pump Thermostat characteristic
  - Water set temperature = Tank set temperature or **[60°C]** whichever lower.
  - Heat pump Water Outlet set temperature is set to Maximum (63°C) at tank mode

i. Case 1
   - THERMO OFF TEMP:
     1 THERMO OFF TEMP = Water set temperature + **[0°C]**.
     2 Tank temperature > THERMO OFF TEMP for continuous 3 minutes, heat pump OFF and water pump OFF.

   - THERMO ON TEMP:
     1 THERMO ON TEMP = Water set temperature + **[-2°C]**.
       When detect tank temperature < THERMO ON TEMP, water pump ON for 3 minutes then heat pump ON.

ii. Case 2
   - Heat pump THERMO OFF TEMP:
     1 Heat pump THERMO OFF TEMP = 63°C + **[+4°C]**.
     2 Water outlet temperature > Heat pump THERMO OFF TEMP for continuous 3 minutes, heat pump OFF.

   - Heat pump THERMO ON TEMP:
     1 Heat pump THERMO ON TEMP = Water inlet during thermo off time + **[-3°C]**.
     2 Heat pump ON back when water outlet temperature < Heat pump THERMO ON TEMP.

iii. Case 3
   - Heat pump THERMO OFF TEMP:
     1 Water inlet temperature > 65°C for continuous 60 secs, heat pump OFF.

   - Heat pump THERMO ON TEMP:
     1 Heat pump THERMO ON TEMP = Water inlet temperature < 65°C.

- Booster heater control
  - Booster heater turn On and Off follow normal operation.
  - Booster heater turn ON condition:
    1 During startup time (initialization), Booster heater turn ON after DELAY TIMER.
    2 When tank temperature lower than HEATER ON TEMP
    3 20 minutes from previous heater off.
  - Booster heater turn OFF condition:
    1 When tank temperature higher than tank set temperature for continuous 15 secs.
- Solar 3 way valve
  - Solar pump operates follow solar operation specification.
- 2 way valve closes
- Others
  - Indoor backup heater cannot be ON during tank mode only.

### 12.1.4 Heat + Tank Mode Operation

Setting 1: When Heating priority is set by control panel:

1 3 ways valve control:
- 3 ways valve switch to room side during External Room Thermo ON **OR** Solar 3ways valve ON **OR** Tank Thermo OFF time, and switch to tank side at External Room Thermo OFF **AND** Solar 3 ways valve OFF

2 Heat pump operation control:-
- **During External Room Thermo ON time:** (When room thermo ON, heat pump must operate to room side)
  - Heat pump operate follow normal operation at room side
- **During External Room Thermo OFF time:**
  - Switch 3 ways valve to tank side, IF
    <u>Under Solar Priority Set condition:</u>
    - Tank temperature < Tank THERMO ON TEMP **AND** Solar Valve OFF

    <u>Under Solar Priority Not Set condition:</u>
    - Tank temperature < Tank THERMO ON TEMP
  - Switch back 3 ways valve to room side, Heat pump and water pump turn OFF, IF
    - External Room Thermo ON back **OR**
      <u>Under Solar Priority Set condition:</u>
      - Tank temperature > Tank THERMO OFF TEMP. for continuous 3 minutes **OR** Solar Valve ON

      <u>Under Solar Priority Not Set condition:</u>
      - Tank temperature > Tank THERMO OFF TEMP for continuous 3 minutes

* THERMO ON and THERMO OFF point refer to case below.

<u>Operation condition when 3 ways valve switch to tank side:</u>
- Tank water set temperature = tank set temperature or [60°C] whichever lower
- Heat Pump Water Outlet set temperature is set to [63°C] during tank interval
- Initial Tank THERMO ON TEMP = heat pump tank target temperature + **[-2°C]**

<u>Case 1:</u>
- THERMO OFF TEMP:
  1. THERMO OFF TEMP = Heat pump tank target temperature + **[0°C]**.
  2. Tank temperature > THERMO OFF TEMP for continuous 10 minutes after compressor off, switch 3 ways valve to room side.
- Next THERMO ON TEMP:
  1. THERMO ON TEMP = Heat pump tank target temperature + **[-2°C]** or
  2. If tank temperature < THERMO ON TEMP **AND** External Room Thermo OFF, switch to tank side.

Case 2:

- Heat pump THERMO OFF TEMP:
  1. Heat pump THERMO OFF TEMP = 63°C + **[+4°C]**.
  2. Water outlet temperature > Heat pump THERMO OFF TEMP for continuous 3 minutes, heat pump OFF.

- Next THERMO ON TEMP:
  1. THERMO ON TEMP = Water inlet when heat pump THERMO OFF + **[-3°C]**.
  2. If water outlet temperature < THERMO ON TEMP **AND** External Room Thermo OFF, heat pump ON.

Case 3:

- Heat pump THERMO OFF TEMP:
  1. Water inlet temperature > 65°C for continuous 60 secs, heat pump OFF.

- Next THERMO ON TEMP:
  1. THERMO ON TEMP = Water inlet temperature < 65°C.
  2. If water inlet temperature < THERMO ON TEMP AND External Room Thermo OFF, heat pump ON.

Case 4: (Only during solar priority is set condition)

- When solar request ON, solar valve will ON and switch 3 ways valve to room side

- THERMO ON TEMP:
  1. THERMO ON TEMP = Heat pump tank target temperature + **[-2°C]**.
  2. If tank temperature < THERMO ON TEMP AND External Room Thermo OFF **AND** Solar 3WV OFF, switch to tank side.

3 Backup Heater control:-

- During External Room Thermo ON time, follow normal backup heater control operation
- During External Room Thermo OFF time, Backup heater OFF

4 Booster heater control:

- Booster heater On/Off follow normal operation.

  * Under solar priority is set condition, when solar 3 way valve is ON, booster heater turn OFF.

5 Solar 3 way valve:

- Solar 3 way valve operates follow solar operation specification.

  * Under solar priority is set condition, when solar 3WV turn ON, booster heater will turn OFF and 3 ways valve switch to room side.
  * Under solar priority is not set condition, solar 3WV will OFF when heat pump operate to tank side.

- 2 way valve opens.

Setting 2: When heating priority is not set by control panel:

- When Solar Priority is set / not set by control panel:

1 3 ways valve control:

- 3 ways valve switch to room side during heating heat-up interval, and switch to tank side during tank heat-up interval. Both mode will switch alternatively. Tank mode is the Initial running mode of this heat + tank mode (heating no priority).

2 Heat pump operation control:

- During heating heat-up interval
  - Follow normal heating operation.

    Under solar priority set condition:
    - Switch to tank heat-up interval and start counting tank heat-up timer when External Room Thermo OFF **AND** solar 3WV OFF **AND** Tank temperature < THERMO ON TEMP (End Room Interval Early) **OR**
    - Switch to tank heat-up interval and start counting tank heat-up timer when tank temperature < THERMO ON TEMP **AND** solar 3WV OFF after room heat-up timer complete

    Under solar priority not set condition:
    - Switch to tank heat-up interval and start counting tank heat-up timer when External Room Thermo OFF **AND** Tank temperature < THERMO ON TEMP (End Room Interval Early) **OR**

- Switch to tank heat-up interval and start counting tank heat-up timer when tank temperature < THERMO ON TEMP after room heat-up interval timer complete

* THERMO ON TEMP is defined form following Case1 to Case4.

- o During tank heat-up interval
  - Heat pump tank target temperature = Tank set temperature or [60°C] whichever lower
  - Heat pump Water Outlet set temperature is set to Maximum [65°C] during tank interval
  - Initial Tank THERMO ON TEMP = heat pump tank target temperature + **[-2°C]**

Case 1:

- THERMO OFF TEMP:
  1. THERMO OFF TEMP = Heat pump tank target temperature + **[0°C]**.
  2. Tank temperature > THERMO OFF TEMP for continuous 10 seconds after heat pump off due to water thermo, switch 3 ways valve to room side. End Tank heat-up interval and start count heating heat-up interval.

- THERMO ON TEMP:
  1. THERMO ON TEMP = Heat pump tank target temperature + **[-2°C]**.
  2. After Heating heat-up interval, always detect tank temperature. Switch to next tank heat-up interval when tank temperature < THERMO ON TEMP

Case 2:

- Heat pump THERMO OFF TEMP:
  1. Heat pump THERMO OFF TEMP = 53°C + **[+4°C]**.
  2. Water outlet temperature > Heat pump THERMO OFF TEMP for continuous 3 minutes, heat pump OFF.

- THERMO ON TEMP:
  1. THERMO ON TEMP = Water inlet temperature, when heat pump thermo off + **[-3°C]**.

Case 3:

- Heat pump THERMO OFF TEMP:
  1. Water inlet temperature > 60°C for continuous 60 secs, heat pump OFF.

- THERMO ON TEMP:
  1. THERMO ON TEMP = Water inlet temperature < 65°C.

Case 4 (Only during solar priority is set condition):

- When solar pump ON, tank heat-up interval end early and 3 ways valve switch to room side.

- THERMO ON TEMP:
  1. THERMO ON TEMP = Heat pump tank target temperature + **[-2°C]**.
  2. After Heating heat-up interval, always detect tank temperature. Switch to next tank heat-up interval when tank temperature < THERMO ON TEMP and solar 3 way valve OFF.

- Tank interval will end and start heating interval timer, IF
  1. Tank interval timer finish AND External Room Thermo ON **OR**
  2. Fulfill above Case 1 of thermo off condition.

3 Backup heater control:
- o During heating heat up interval.
  - Follow normal backup heater control operation.
- o During tank heat-up interval.
  - Backup heater OFF during this interval.

4 Booster heater control:
- o During heating heat-up interval.
  - Booster heater ON/OFF according to booster heater operation control.
- o During tank heat-up interval.
  - Once switch from heating heat-up interval to tank heat-up interval, turn off the booster heater and start counting the BOOSTER HEATER DELAY TIMER.
  - Booster heater turn ON after BOOSTER HEATER DELAY TIMER fulfill and tank temperature lower than tank set temperature.
  - BOOSTER HEATER DELAY TIMER is clear when switch to heating heat-up interval.

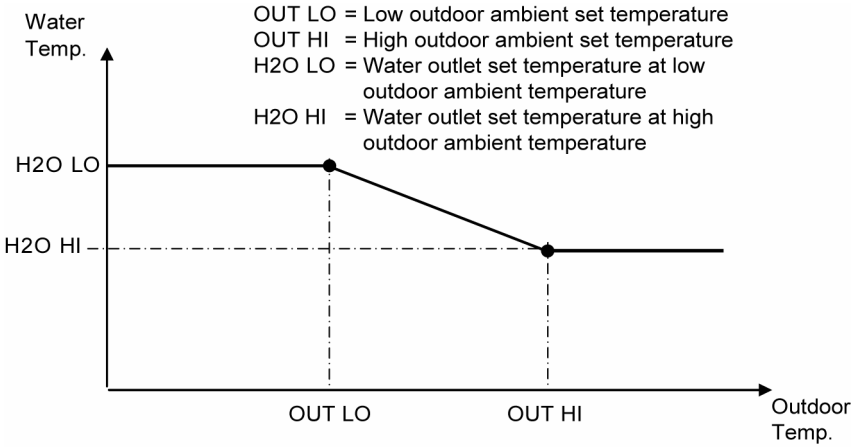
5 Solar 3 way valve:
   - Solar 3WV operates follow solar operation specification.

   * Under solar priority is set condition, when solar 3WV is ON, booster heater turn OFF
   * Under solar priority is not set condition, solar 3WV only can ON during heating heat-up interval.

6 2 way valve opens.

### 12.1.5 Setting Water Outlet Temperature for Heat Mode

- The set temperature define the parameters for the outdoor ambient temperature dependent operation of the unit. Where by the internal water setting temperature is determined automatically depending on the outdoor temperature. The colder outdoor temperatures will result in warmer water and vice versa. The user has the possibility to shift up or down the target water temperature by control panel setting.




- Change in setting water outlet temperature is updated every 30 minutes.

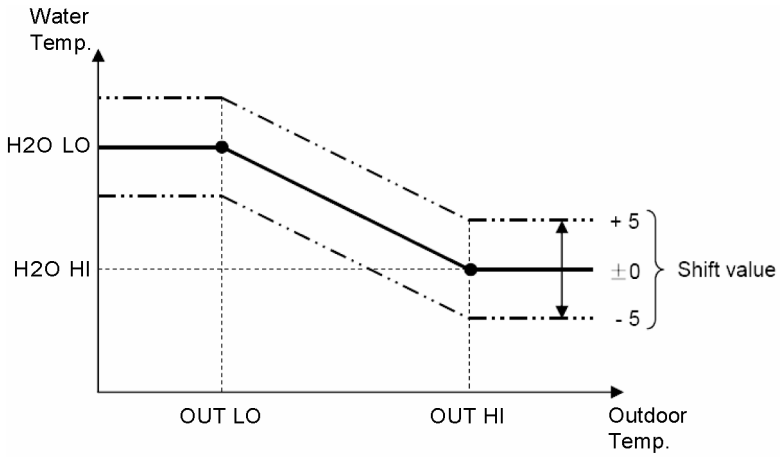
#### *12.1.5.1 Heating Mode Operation Time Chart*

- Operation of heat pump provide heating capacity to room side by hot water through heating panel, floor or fan coil.

1 3 ways valve control:
   - 3 ways valve switch and fix to heating side.
2 Heat pump operate follow normal heating operation.
3 Backup heater operate follow normal operation.
4 Solar 3 way valve operates follow solar operation specification.
5 2 way valve opens.

### 12.1.6 Water Temperature Thermo Shift Setting

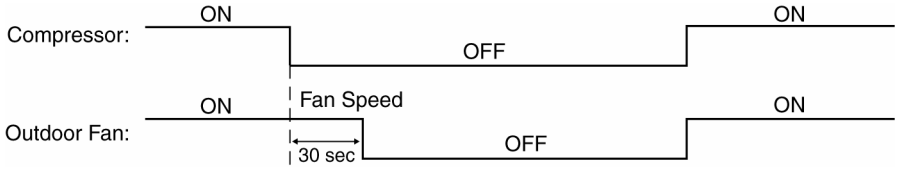
- Switchs are ignored during “PUMPDW” = ON.
- Switchs are ignored during “STATUS” = ON.
- “▲”, “▼”, “SELECT” switch are ignored if “SETTING” = OFF.
- “CANCEL” switch is ignored if “SETTING” = OFF & “STATUS” = OFF.
- If “SET” Switch pressed for less than 5secs, immediately enter water temperature shift setting mode.
- Once enter this setting mode, “SETTING” display is ON.
  This setting mode is used to easily shift the target water outlet temperature.




OUT LO = Low outdoor ambient set temperature
OUT HI = High outdoor ambient set temperature
H2O LO = Water outlet set temperature at low outdoor ambient temperature
H2O HI = Water outlet set temperature at high outdoor ambient temperature
Shift value = Setting water temperature thermo shift

### 12.1.7 Outdoor Fan Motor Operation

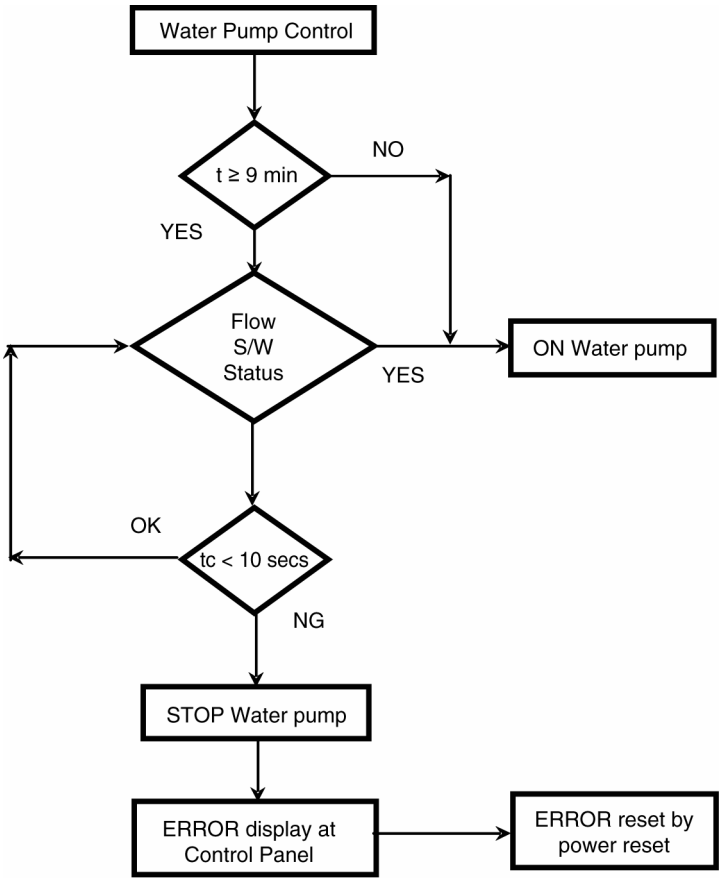
Outdoor fan motor is adjusted according to operation condition. It starts when compressor starts operation and it stops 30 seconds after compressor stops operation.



## *12.2 Water Pump*

### 12.2.1 Water Pump Control

1 Once the indoor unit is ON, the water pump will be ON immediately and no error judgement for 9 minutes. However, during this 9 minutes operation, if there is any abnormality cause at outdoor or malfunction, the compressor should be OFF immediately and restart delay after 3 minutes.
2 The system will start checking on the water flow level after operation start for 9 minutes. If water flow level is detected low continuously for 10 secs, the water pump and compressor will be OFF permanently and OFF/ON control panel LED will blink (H62 error occurs).
3 When error happen, the power has to be reset to clear the error.
4 If there is no error indication, The water pump shall be continuously running.
5 The water pump will remain ON when compressor OFF due to thermostat OFF setting is reached.




6 Pump ON-OFF control
   a. During operation OFF or water pump stop at Tank Mode
   b. During ERROR stop
   c. Water flowing flag = ON
   d. Outdoor air temperature < 30°C

   When above [(a) or (b)] and (c) and (d) conditions fulfilled,
   PUMP ON for 4 minutes, and OFF for 55 minutes continuously
   When any of below mentioned condition below is achieved, this control is cancelled
   f. Operation = ON (except during water pump stop at tank mode)
   g. Water pump run at tank mode
   h. Change from tank mode to another mode during water pump stop at tank mode
   i. Outdoor air temperature ≥ 32°C
   j. Water inlet temperature < 38°C for 30 minutes continuously

## *12.3 Pump Down Operation*

**Purpose**

Ensure the pump down operation when relocating or disposing of the unit. The pump down operation will extract all refrigerant from the piping into the outdoor unit.

- Pump down operation control:
  1 Press the SERVICE S/W for continuous 5 secs to enter Service mode.
  2 In service mode, select Sr:01 and press SET S/W to start Pump Down operation.
  3 There will be no Low Pressure error & Freeze prevention judgement during pumpdown operation.
  4 3 ways valve will shift to room side.
  5 Press the ON/OFF button to stop the unit.

## *12.4 Flow Switch*

### 12.4.1 Flow Switch Control

1 The water flow switch serve as an overload protector that shuts down the unit when the water level is detected to be low.
2 Detection is Lo (0V) when there is no water flow, and detection is Hi (5V) when there is water flow.

## *12.5 Force Heater Mode Operation*

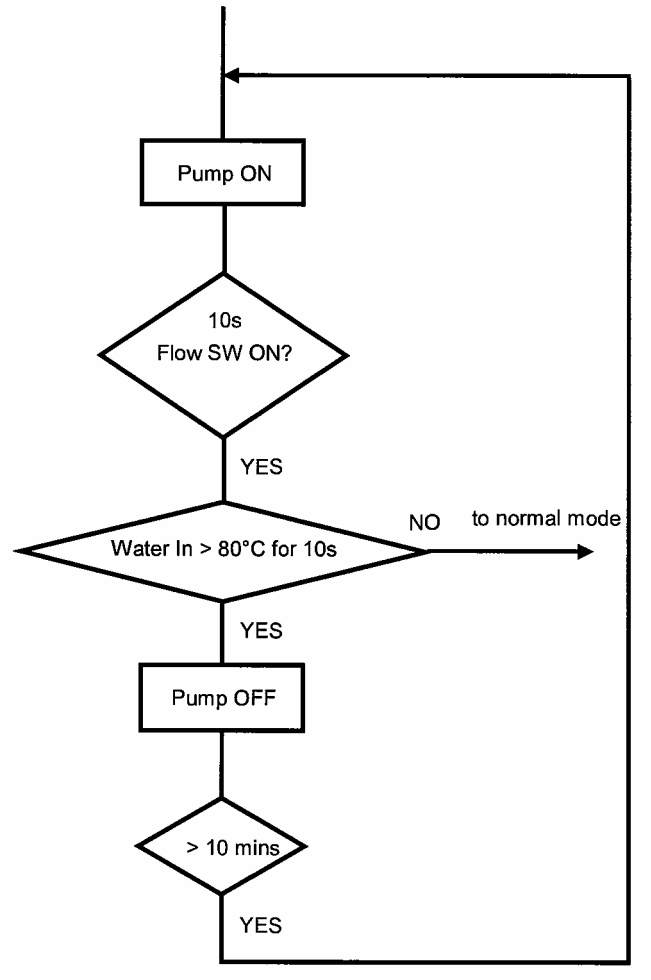
The backup heater also serves as backup in case of malfunctioning of the outdoor unit.

1 Make sure the OFF/ON control panel LED is OFF (no operation).
2 Press the Force button to start the force heater mode operation.
3 During force heater mode, all other operations are not allowed.
4 Press OFF/ON button to stop the force heater mode operation.

## 12.6 Indoor Unit Safety

### 12.6.1 Indoor Unit Safety Control

1 When water pump is ON, the system will start checking flow switch status (ON/OFF).
2 If the flow switch ON for 10 seconds, the system will check on the water inlet temperature for 10 seconds.
If the water inlet temperature not exceeds 80°C, the water pump shall be continuously running with normal mode.
If the water inlet temperature exceeds 80°C for continuously 10 seconds, the water pump will be OFF immediately.
3 After water pump OFF for more than 10 minutes, it will be ON back and the indoor unit safety control checking is restarted.




## 12.7 Auto Restart Control

When the power supply is cut off during the operation of Air-to-Water Heatpump, the compressor will re-operate after power supply resumes.

## 12.8 Indication Panel

| LED | Operation |
|---|---|
| Color | Green |
| Light ON | Operation ON |
| Light OFF | Operation OFF |

**Note:**

- If Operation LED is blinking, there is an abnormality operation occurs.

## *12.9 Indoor Back-Up Heater Control*

### 12.9.1 Indoor Electric Heater Control

1 Normal Heating Mode
- Heater On condition:
  a. Heater switch is ON
  b. After Heatpump thermo ON for **[30]** mins
  c. After water pump operate **[9]** mins
  d. Outdoor air temperature < Outdoor set temperature for heater
  e. **[20]** minutes since previous Backup heater Off
     * When heatpump cannot operate due to error happens during normal operation, heater will go into force mode automatic
     * Heater need to operate during deice operation
  f. When water outlet temperature < Water set temperature + **[-8°C]** (check water out temperature before ON heater 3 and check also water out temperature after heater delay timer before ON heater 2 and 1)

- Heater Stop Condition:
  a. When outdoor set temperature > outdoor set temperature + **[+2°C]** for continuous 15 secs OR
  b. When water out temp> water set temperature + **[-2°C]** for continuous 15 secs OR
  c. Heater switch is Off OR
  d. Heat pump thermo-off or OFF condition

2 Force Heater Mode
- Heater On Condition:
  a. After water pump operate **[9]** mins
  b. When water outlet temperature < water set temperature + **[-8°C]**
  c. **[20]** minutes since previous Backup heater Off

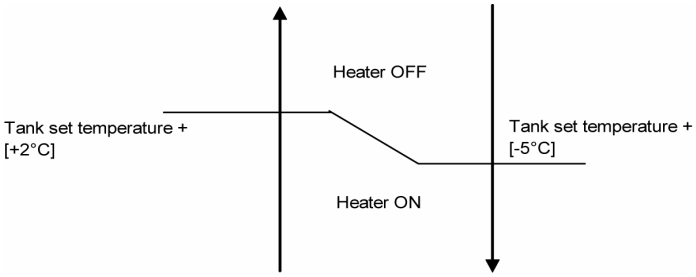
- Heater Stop condition
  a. Force mode off **OR**
  b. When water outlet temperature > water set temperature + **[-2°C]** for continuous 15 secs

* Do not operate heater at the following situation
1 Water outlet temperature sensor, and water inlet sensor abnormal
2 Flow switch abnormal
3 Circulation pump stop condition
4 During Heatpump switch to tank side

## *12.10 Tank Booster Heater Control*

### 12.10.1 Tank Booster Heater Control

Heating operation condition:




1 Booster heater Turn On condition:
   - After BOOSTER HEATER DELAY TIMER fulfill during heat pump startup time in tank mode, or during switching from heating heat-up interval to tank heat-up interval in heat + tank mode (heating priority not set).
   - Tank temperature < Tank set temperature + **[-5°C]**,
   - 20 minutes since previous heater off.

   * BOOSTER HEATER DELAY TIMER is clear when tank heat-up interval end.

2 Booster heater Turn Off condition:
   - Tank temperature > Tank set temperature + **[+2°C]** for continuous 15 secs
   - When BOOSTER HEATER DELAY TIMER start count after switch from heating heat-up interval to tank heat-up interval

   * DELAY TIMER can be set by control panel.

## *12.11 Three Way Valve Control*

- Purpose:
  - 3 ways valve is used to change flow direction of hot water from heat pump between heating side and tank side
- Control contents:
  1 3 ways valve switch Off:
     - During 3 ways valve switch Off time, the hot water will provide heat capacity to heating side.
  2 3 ways valve switch On:
     - During 3 ways valve switch On time, the hot water will provide heat capacity to tank side.
  3 Stop condition:
     - During stop mode, 3 ways valve will be in switch off position

## *12.12 Sterillization Mode*

- Purpose:
  - Boil tank temperature to customer set boiling temperature to operate sterilization.

- Control start condition:
  - **Tank connection set to YES by remote controlller**
  - **Serilization function selection is YES**
  - Sterilization signal received from remote controller by timer.

- Control stop condition:
  - After boiling timer completed. Boiling timer start counting once tank achieve boiling set temperature OR
  - After 4 hours of operation since sterilization function start OR

- Control content:
  - Once the sterilization function enable, set the target tank temperature to Boiling Set Temperature.
  - Booster heater will allow to ON during solar priority SET condition.
    - Booster heater OFF Temp. = Boiling Set Temperature + 2°C
    - Booster heater ON Temp. = Boiling Set Temperature - 5°C
  - Boiling timer which set by remote controller will start count after tank achieve boiling set temperature.
  - Sterilization operation will end after complete boiling timer or Max 4 hrs from function start.
  - Target tank temperature will set back to normal tank set temperature.

  * Tank heater control is not affected by solar pump when solar priority set.

## *12.13 Quiet Operation*

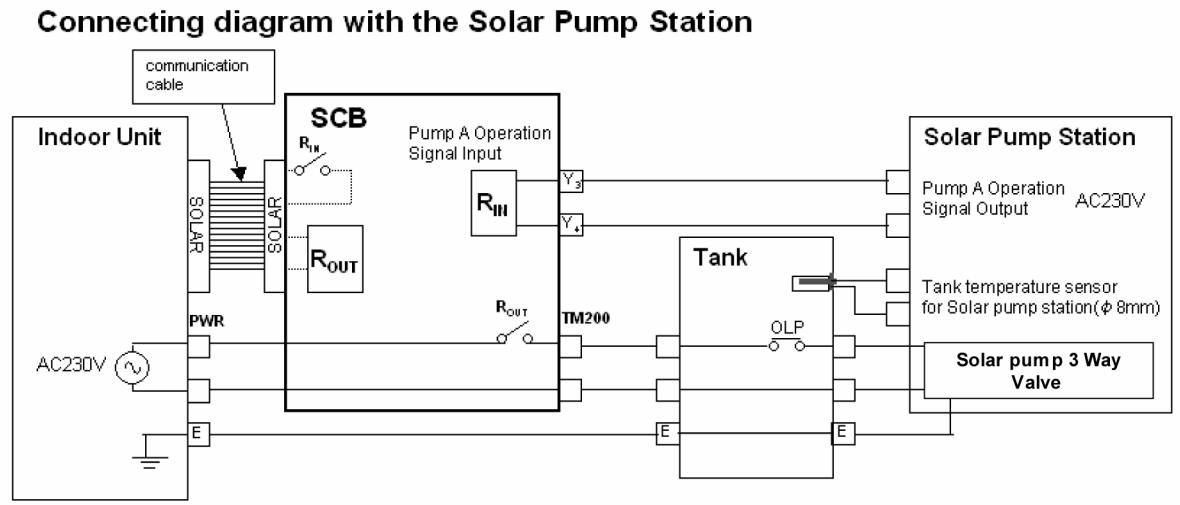
- Purpose:
  - To provide quiet operation compare to normal operation by reduces outdoor unit noise.
- Starting condition:
  1 When quiet button is presses.
  2 When quiet request ON time by weekly timer (Refer to control panel.)
- When any of above mentioned condition is achieved, this control is activated.
  New target FM speed = Present target FM speed - 80 rpm
  Minimum target FM speed = 200 rpm
- Cancellation condition:
  1 Cancel by press quiet button
  2 Stop by OFF/ON button
  3 When quiet request OFF time by weekly timer
  When any of above mentioned condition is achieved, this control is cancelled.

## *12.14 Solar Operation (Optional)*

### 12.14.1 Solar Operation

1 External solar heat source signal can be connect to unit for proper control of heat source switching during tank boiling time.
2 Control according to preset whether solar priority is set or not.
3 When tank connection is NOT set at SETTING mode, solar operation is disabled.
4 When Pump A (from solar pump station) is detected On through connection Y3 and Y4, then the Solar pump 3 Way Valve is requested ON (Refer to figure below).

**Connecting diagram with the Solar Pump Station**




### 12.14.2 Solar Operation Control

When solar priority is SET
1 Operation condition:
  a Solar pump operates if all of the following conditions are fulfilled:
    - Power On. (regardless operation ON or OFF)
    - There is operation request from solar pump station.
    - Tank hot water temp is below solar on upper limit temp 80°C.
2 Stop condition:
  a Solar pump stops operating when:
    - No power supply to unit **OR**
    - There is **NO** operation request from solar pump station **OR**
    - Tank hot water temp is above solar off upper limit temp 72°C.

  * heat pump OFF OR operate to room side when solar pump operate during solar priority set.
  * booster heater OFF when solar pump operate during solar priority set.

When solar priority is NOT SET

1 Operation condition:

a Solar pump operates if all of the following conditions are fulfilled:

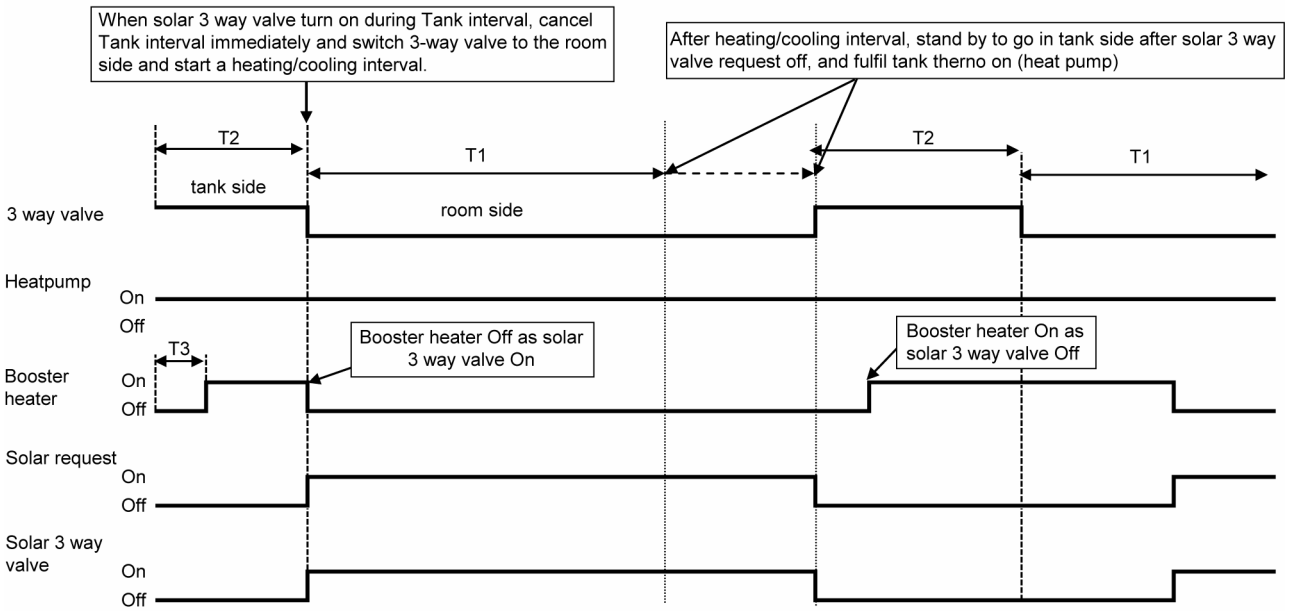
- Power On. (regardless operation ON or OFF).
- There is operation request from solar pump station.
- Tank hot water temp is below solar on upper limit temp 80°C.
- Heat pump thermo OFF in tank mode OR Heat pump operate to room side (during operation ON and tank mode selected).

2 Stop condition:

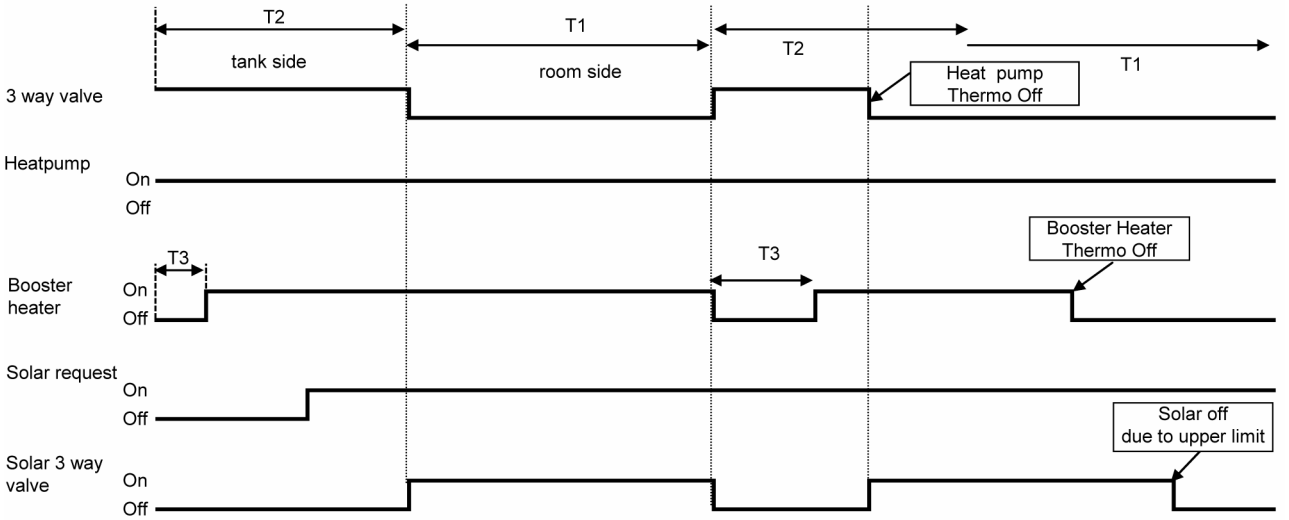
a Solar pump stops operating when:

- No power supply to unit **OR**
- There is **NO** operation request from solar pump station **OR**
- Tank hot water temp is above solar off upper limit temp 72°C.
- Heat pump thermo ON and operate to tank side. (during operation ON and tank mode selected).

<u>Heat + Tank Mode (Heating priority not set)</u>
<u>(Solar Priority Set)</u>

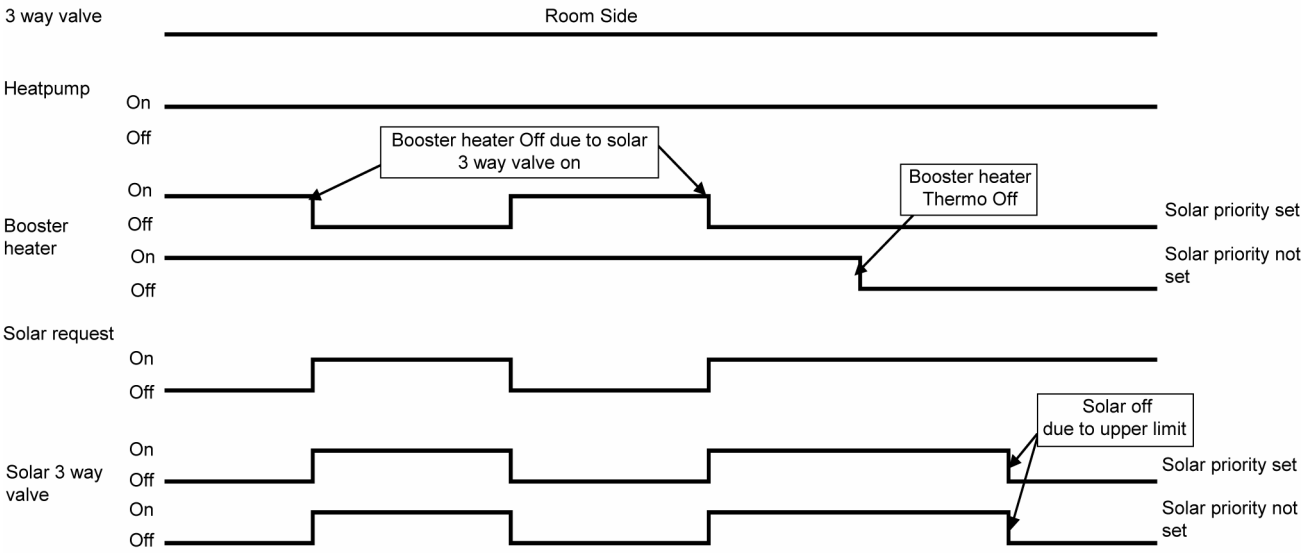



<u>(Solar Priority Not Set)</u>

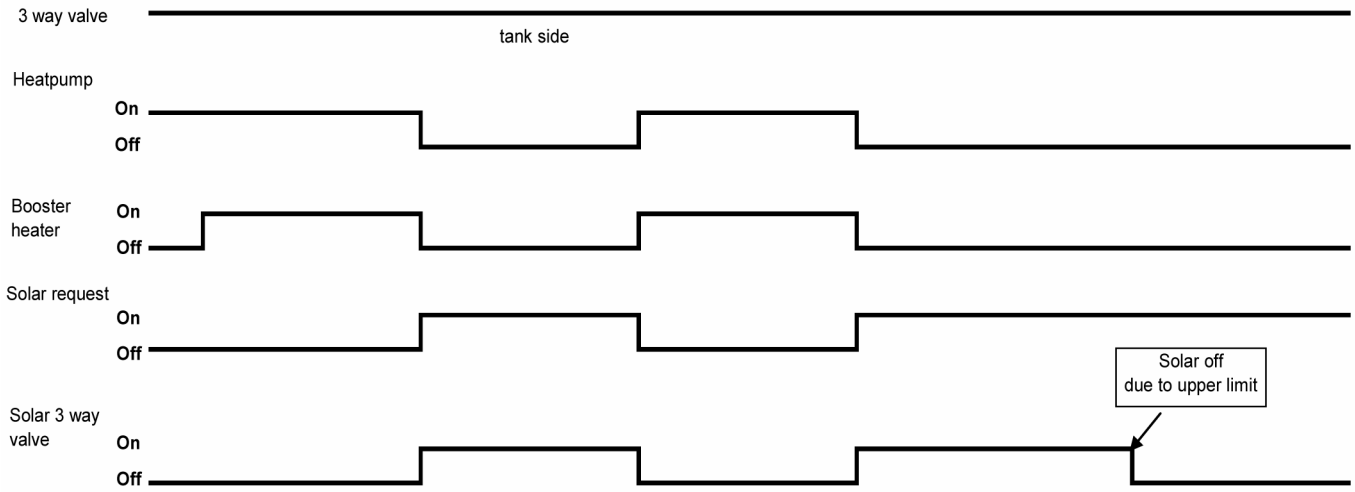



T1 - Heating
T2 - Tank interval
T3 - Booster heater delay timer

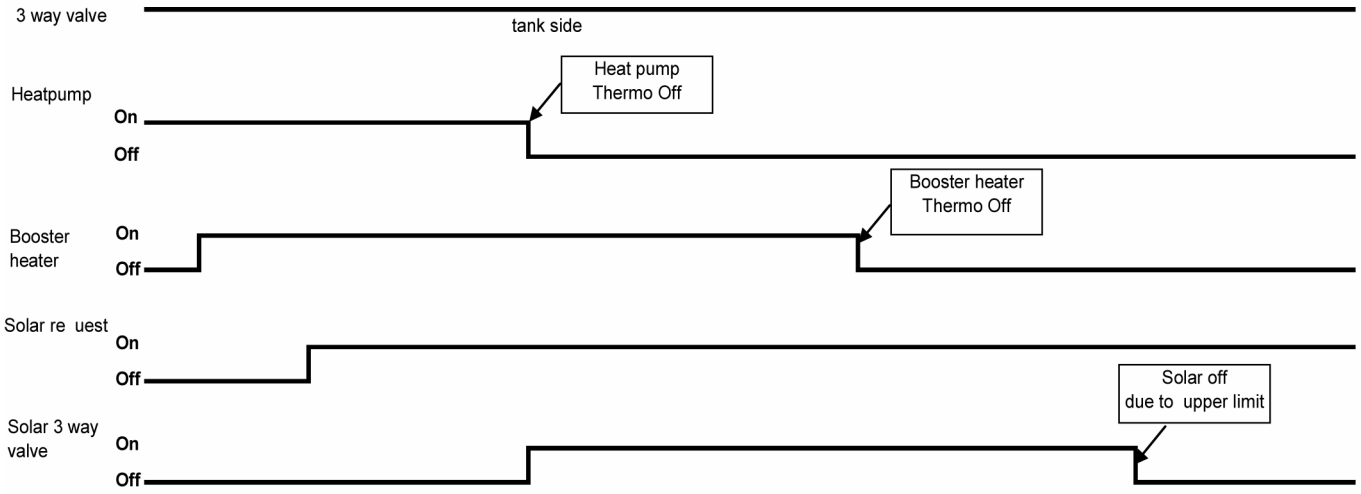
## Heat + Tank Mode (Heating Priority Set)




## Tank Mode [Solar priority SET condition]




## Tank Mode [Solar priority NOT SET condition]



## *12.15 External Room Thermostat Control (Optional)*

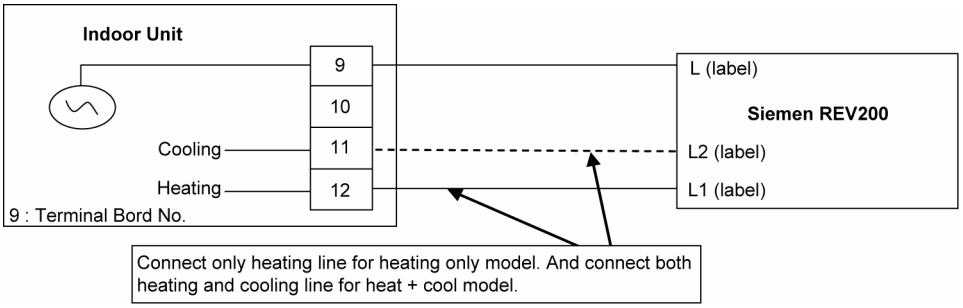
Purpose:

1 Better room temperature control to fulfill different temperature request by external room thermostat.
Recommended external room thermostat:

| Maker | Characteristic |
|---|---|
| Siemen (REV200) | Touch panel |
| Siemen (RAA20) | Analog |

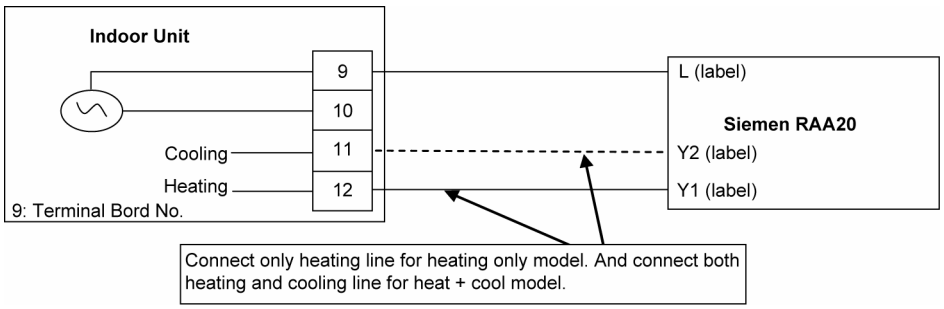
Connection external room thermostat:
Wire Connection and thermo characteristic of Siemen REV200:

| Setting | L/L1 (H) | Heat Thermo | L/L2 (C) | Cool Thermo |
|---|---|---|---|---|
| Set Temp < Actual Temp | Open Circuit | OFF | Short Circuit | ON |
| Set Temp > Actual Temp | Short Circuit | ON | Open Circuit | OFF |




Wire Connection and thermo characteristic of Siemen RAA20:

| Setting | L/Y1 (H) | Heat Thermo | L/Y2 (C) | Cool Thermo |
|---|---|---|---|---|
| Set Temp < Actual Temp | Open Circuit | OFF | Short Circuit | ON |
| Set Temp > Actual Temp | Short Circuit | ON | Open Circuit | OFF |




Control Content:

- External room thermostat control activate only when remote thermostat connection select YES by Indoor control panel.
- When indoor running heat mode, refer thermo On/Off from heating line feedback. And when indoor running cool mode, refer thermo On/Off from cooling line feedback.
- Heat pump Off immediately when receive thermo off feedback.

# 13. Protection Control

## *13.1 Protection Control for All Operations*

### 13.1.1 Time Delay Safety Control

1 The compressor will not start for three minutes after stop of operation.

### 13.1.2 30 Seconds Forced Operation

1 Once the compressor starts operation, it will not stop its operation for 30 seconds.
2 However, it can be stopped using control panel at indoor unit.

### 13.1.3 Total Running Current Control

1 When the outdoor running current exceeds X value, the compressor frequency will decrease.
2 If the outdoor running current does not exceed X value, the compressor frequency will return to normal operating frequency.
3 If the outdoor running current continue to increase till exceed Y value, compressor will stop, and if this occurs 3 times within 20 minutes, system will stop operation and OFF/ON control panel LED will blink (F16 error occurs).

| | 09D | | 12D | |
|---|---|---|---|---|
| Operation Mode | X (A) | Y (A) | X (A) | Y (A) |
| Heating | 24.0 | 30.0 | 28.0 | 30.0 |

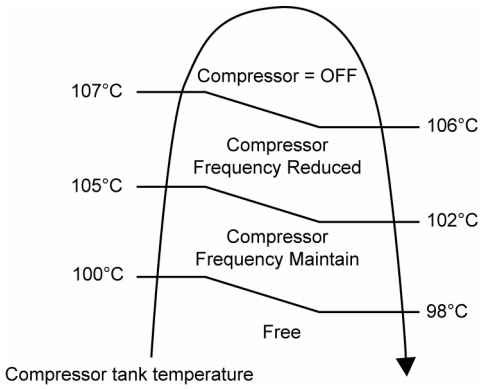
### 13.1.4 IPM (Power Transistor) Prevention Control

A. Overheating Prevention Control
1 When the IPM temperature rises to 95°C, compressor will stop immediately.
2 Compressor will restart delay 3 minutes when the IPM temperature decreases to 90°C.
If this condition repeats continuously 3 times within 30 minutes, system will stop operation and OFF/ON control panel LED will blink (F22 error occurs).

B. DC Peak Current Control
1 When the current to IPM exceeds set value of 53.5 ± 5.0 A, compressor will stop. Compressor will restart after three minutes.
2 If the set value exceeds again for more than 30 seconds after the compressor restarts, operation will restart after two minutes.
3 If the set value exceeds again for within 30 seconds after the compressor restarts, operation will restart after one minute. If this condition repeats continuously for seven times, system will stop operation and OFF/ON control panel LED will blink (F23 error occurs).

### 13.1.5 Compressor Overheating Prevention Control

- The compressor operating frequency is regulated in accordance to compressor tank temperature as shown in below figures. When the compressor tank temperature exceeds 112°C, compressor will stop, and if this occurs 4 times within 30 minutes, system will stop operation and OFF/ON control panel LED will blink (F20 error occurs).



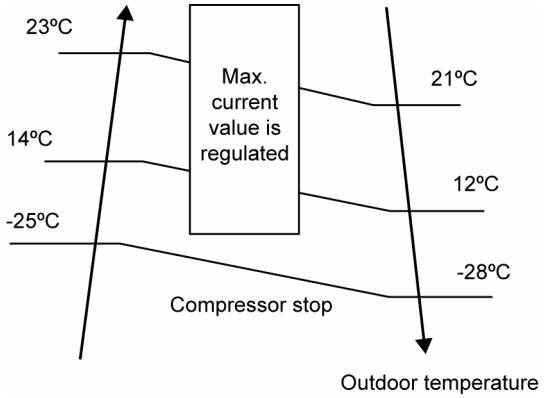
### 13.1.6 Low Pressure Protection Control

- Purpose:
  - To protect the system operation.
  - Detection period:
    - After compressor on for 5 minutes.
  - Detection conditions:
    - When detection of Tem above 30°C.
    - Calculation of average evaporation temperature (Tem).
    - Use outdoor low pressure sensor.
    - Tem use the value calculated for discharge temperature setting value
  - After detection:
    - Compressor stops restart again after 3 mins.
    - When abnormalities continuously generated 60 times within 480 minutes
    - Protection is prohibited.
    - Error H42 will be displayed.

### 13.1.7 High Pressure Sensor Control / Low Pressure Sensor

- Purpose:
  - To protect the system operation.
- Detection period:
  - After compressor on for 1 minute.
- Detection conditions:
  - When abnormal high voltage detection, 5V or when open circuit detection 0V for 5 seconds continuously.
- After detection:
  - When abnormality is detected continue 5 seconds, unit stop operation.
  - OFF/ON control panel LED will blink (H64 error occurs).

### 13.1.8 Outside Temperature Current Control




### 13.1.9 Extreme Low Temperature Control

- Purpose:
  - To improve the compressor reliability during cold start and after deice when running in extreme low outdoor temperature -20°C.

    Starting condition:

    1 Heating operation
    2 Outdoor air temperature < -10°C
    3 Actual frequency ≥ 50Hz
    4 Compressor discharge temperature < 20°C

    When the above condition is fulfilled, this control is activated.

    5Hz up every 30 sec. until it reaches the target frequency.

    Cancellation condition:

    - starting condition not fulfill.
    - Cancel the extreme low temperature control when compressor discharge sensor ≥ 60°C

### 13.1.10 Crank Case Heater Control

- Purpose:
  - For compressor protection during low outdoor ambient operation (during heating low temperature operation).
- Control content:
  a. Trigger heater START condition
     - When the outdoor air temperature is 13°C or below, and discharge temperature is 13.2°C or below.
  b. Resetting heater STOP condition
     1. when the outdoor air temperature exceeds entry condition (15°C).
     2. when the discharge temperature exceeds entry condition (20.2°C).

## *13.2 Protection Control for Heating Operation*

### 13.2.1 Outdoor Air Temperature Control

The maximum current value is regulated when the outdoor air temperature rises above 14°C in order to avoid compressor overloading.

### 13.2.2 Deice Operation

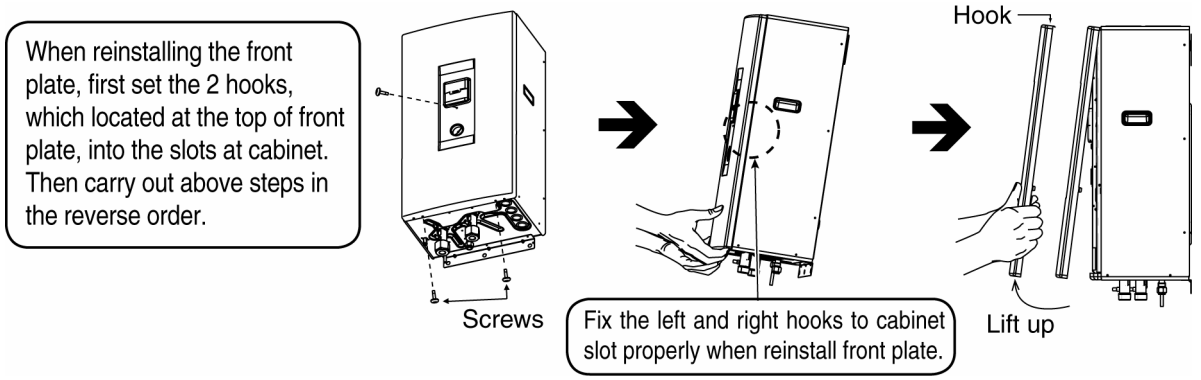
When outdoor pipe temperature and outdoor air temperature is low, deice operation start where outdoor fan motor stop.

# 14. Servicing Mode

## *14.1 How to Take Out Front Plate*

Please follow the steps below for take out front plate. Before removing the front plate of indoor unit, always switch off all power supply (i.e. indoor unit power supply, heater power supply and tank unit power supply).

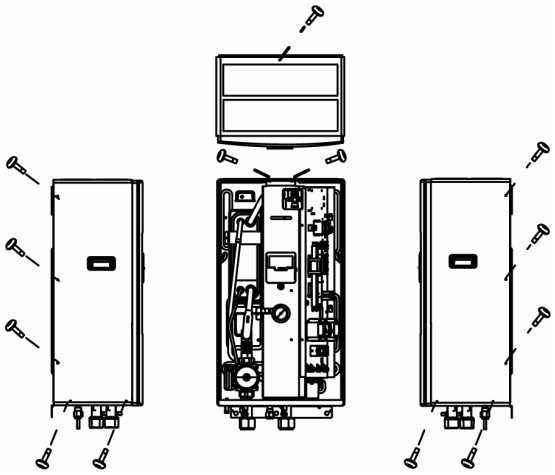
1 Remove the 2 mounting screws which located at bottom of the front plate and 1 mounting screw at the front of the plate.
2 Gently pull the lower section of the front plate towards you to remove the front plate from left and right hooks.
3 Hold the left edge and right edge of front plate to lift up front plate from hooks.




## *14.2 How to Take Out Side Cabinet*

Please follow the steps below to remove the side cabinet. Before removing the front plate of indoor unit always switch off all power supply (i.e. indoor power supply, heater power supply and tank unit power supply).

1 Perform the steps in HOW TO TAKE OUT FRONT PLATE.
2 Remove all the 13 mounting screws on the left, right and top of the side cabinet.
3 Gently remove the side cabinet by holding both of the handles.



## *14.3 Test Run*

1 Fill up the boiler tank with water. For details refer to boiler tanks installation instruction and operation instruction.
2 Set ON to the indoor unit and RCCB/ELCB. Then, for control panel's operation please refers to air-to-water heatpump's operation instruction.
3 For normal operation, pressure gauge reading should be in between 0.05 MPa and 0.3 MPa.
If necessary, adjust the water pump speed accordingly to obtain normal water pressure operating range. If adjust water pump speed cannot solve the problem, contact your local authorized dealer.
4 After test run, please clean the external filter. Reinstall it after finish cleaning.

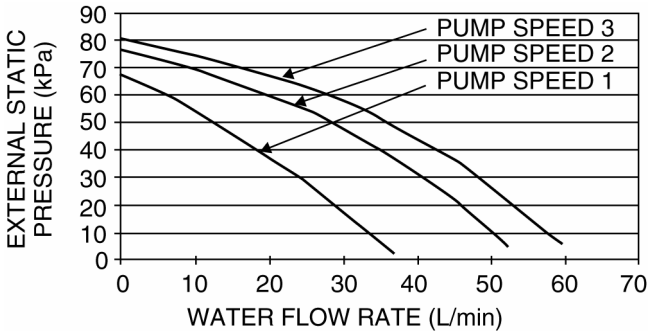
## *14.4 Proper Pump Down Procedure*

- Strictly follow the steps below for proper pump down procedure. Explosion may occur if the steps are not followed as per sequence.

1 Press the "SERVICE" switch on control panel to enter SERVICE mode. Operate the system in Sr : 01 mode for pump down operation.
2 After 10~15 minutes, (after 1 or 2 minutes in case very low ambient temperatures (< 10°C)), fully close 2 way valve.
3 After 3 minutes, fully close 3 way valve.
4 Press the "OFF/ON" switch on control panel to stop pump down operation.
5 Remove the refrigerant piping.

## 14.5 How to Adjust Water Flow Rate

- Before adjust the water flow rate, make sure that the total water volume in the installation is 50 litres minimum.
- The water flow rate can be adjusted with select the water pump speed on the water pump. The default setting is moderate speed (II). However, please ensure the minimum flow rate cannot be less than 18L/min. Adjust it to high speed (III) and slow speed (I) if necessary (e.g. reduce the noise of running water).
- Below graph shown the external static pressure (kPa) versus water flow rate (L/min).




- Flow rate characteristic of indoor unit is as per above mentioned.

## 14.6 Expansion Vessel Pre Pressure Checking

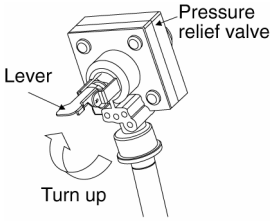
- Expansion Vessel with 10L air capacity and initial pressure of 1 bar is installed in this indoor unit.
- Total amount of water in system should be below 200L.
  (Note: This amount of water is not include the tank unit volume)
- If total amount of water is over 200L, please add expansion vessel.
- Please keep the installation height difference of system water circuit within 10m.
  (Inner volume of same indoor unit is about 5L)

# 15. Maintenance Guide

In order to ensure optimal performance of the unit, checks and inspections on the unit and the field wiring must be carried out regularly.
Before carried out any maintenance or repair work, and removing the front plate of heat exchanger unit, always switch off all power supply (i.e. indoor unit power supply, heater power supply and sanitary tank power supply).
Below checks must be carried out at least once a year.

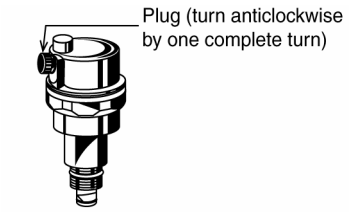
1 Water pressure
Water pressure should not lower than 0.05 MPa (with inspects the pressure gauge). If necessary add tap water into boiler tank. Refer to boiler tank installation instruction for details on how to add water.

2 Pressure relief valve
- Check for correction operation of pressure relief valve by turn up the lever to become horizontal. (Refer to figure below)
- If you do not hear a clacking sound (due to water drainage), contact your local authorized dealer.
- Turn down the lever after checking finish.
- In case the water keeps drained out from the unit, switch off the system, and then contact your local authorized dealer.



How to check pressure relief valve

3 Air purge valve
Air purge valve must be installed at all high points in a closed water circuit system.
An automatic air purge valve is provided inside the indoor unit. To automatically purge the air from the system, turn the plug on the air outlet anticlockwise by one complete turn from fully closed position.
Excessive air is automatically purged if the plug is kept in this position.



Air purge valve

4 Indoor unit control board area
Thorough visual inspection of the control board and look for defects, i.e. loose connection, melting of wire insulator and etc.

5 RCCB/ELCB
Ensure the RCCB/ELCB set to “ON” condition before check RCCB/ELCB.
Turn on the power supply to the indoor unit.
This testing could only be done when power is supplied to the indoor unit.

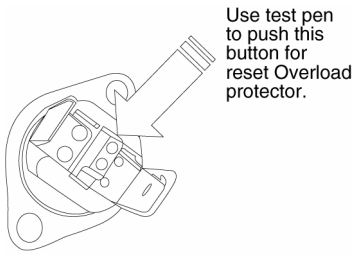
| ⚠ **WARNING** |
| --- |
| Be careful not to touch parts other than RCCB/ELCB test button when the power is supplied to Indoor Unit. Else, electrical shock may happen. |

- Push the “TEST” button on the RCCB/ELCB. The lever would turn down and indicate “0” and indicate green colour if it functions normal.
- Contact authorized dealer if the RCCB/ELCB malfunction.
- Turn off the power supply to the indoor unit.
- If RCCB/ELCB functions normal, set the lever to “ON” again after testing finish.

6 Reset overload protector

Overload protector serves the safety purpose to prevent the water over heating. When the overload protector trip at high water temperature, take below steps to reset it.

a. Take out OLP cover.
b. Use a test pen to push the centre button gently in order to reset the Overload protector.
c. After finish, install back the Overload protector following the reverse order of step a & b.

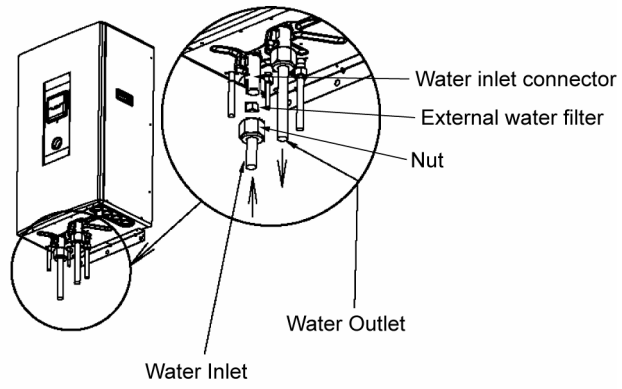



How to reset Overload protector

7 External water filter (field supply)

Clean the external water filter in regularly basic.

- External water filter is located inside the tube connector which is before water inlet connector of indoor unit (indicated with “WATER IN”). (Refer to figure below)
- Use spanner to detach the tube connector nut.
- Take out the filter carefully so that not deforms it shape.
- Use tap water only to wash the residue on the filter. If necessary, gently use soft brush only to clean the hard dirt.
- After clean, put it back to the original location and tighten the nut connection with torque wrench.




Location of external water filter

# 16. Troubleshooting Guide

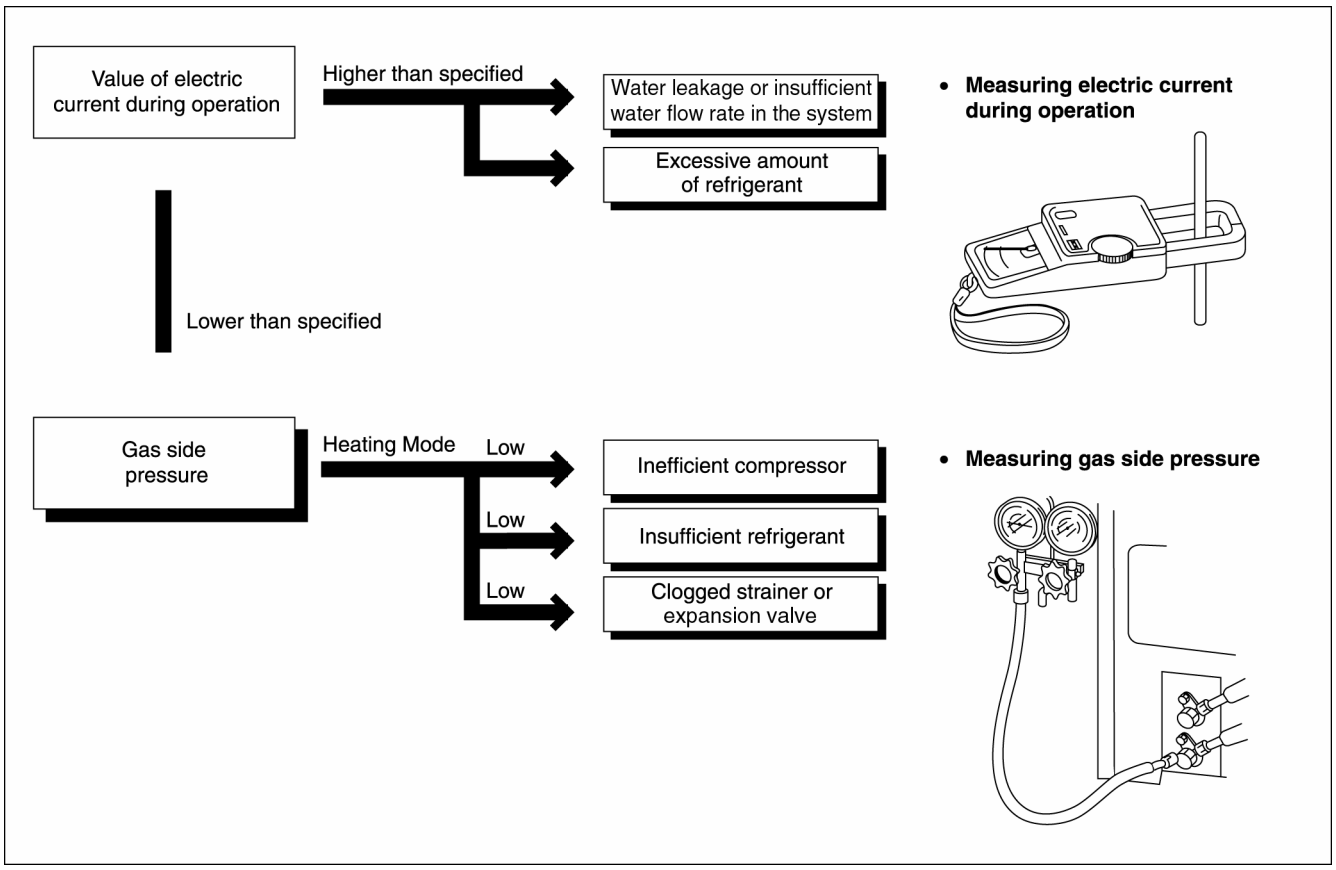
## *16.1 Refrigeration Cycle System*

In order to diagnose malfunctions, make sure that there are no electrical problems before inspecting the refrigeration cycle.
Such problems include insufficient insulation, problem with the power source, malfunction of a compressor and a fan.
The normal pressure of the refrigeration cycle depends on various conditions, the standard values for them are shown in the table on the right.

Normal Pressure (Standard)

| | Gas pressure MPa (kg/cm²G) |
|---|---|
| Heating Mode | 1.4 ~ 1.8 (14 ~ 18) |

★ Condition:
- Outdoor temperature 7°C at heating mode.
- Compressor operates at rated frequency.
- Water outlet temperature 35°C at heating mode.



## *16.2 Relationship between the Condition of the Air-to-Water Heatpump Indoor and Outdoor Units and Pressure and Electric Current*

| Condition of the Air-to-Water Heatpump indoor and outdoor units | Heating Mode | | |
|---|---|---|---|
| | Low Pressure | High Pressure | Electric current during operation |
| Water leakage or insufficient water flow rate in the system | | | |
| Excessive amount of refrigerant | | | |
| Inefficient compression | | | |
| Insufficient refrigerant (gas leakage) | | | |
| Outdoor heat exchange deficiency | | | |
| Clogged expansion valve or Strainer | | | |

- Carry out the measurements of pressure, electric current, and temperature fifteen minutes after an operation is started.

## *16.3 Breakdown Self Diagnosis Function*

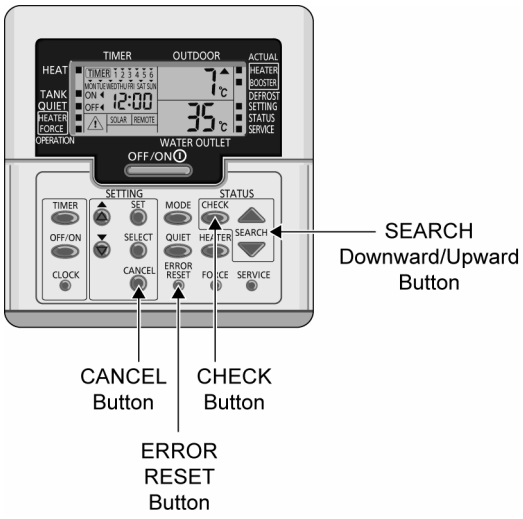
### 16.3.1 Self Diagnosis Function (Three Digits Alphanumeric Code)

- When abnormality occur during operation, the system will stop operation, and OFF/ON control panel LED will blink and error code will display on the control panel timer display LCD.
- Even error code is reset by turning OFF power supply or by pressing ERROR RESET button, if the system abnormality is still un-repaired, system will again stop operation, and OFF/ON control panel LED will again blink.
- The error code will store in IC memory.

- **To check the error code**
  1 When an abnormality occurs, system will stop operation and OFF/ON control panel LED will blink.
  2 Error code of the abnormality will display on the control panel timer display LCD.
  3 To determine the abnormality description, the error code table needs to be referred.

- **To display past/last error code**
  1 Turn ON power supply.
  2 Press and hold the CHECK button for more than 5 seconds to enter status mode.
  3 Press the SEARCH DOWN/UP button to retrieve past/last error code.
  4 Press the CANCEL button or wait 30 seconds to exit status mode.

- **To permanently delete error code from IC memory**
  1 Turn ON power supply.
  2 Press and hold the ERROR RESET button for more than 8 seconds till a beep sound is heard.



## 16.4 Error Codes Table

| Diagnosis display | Abnormality/Protection control | Abnormality judgement | Primary location to verify |
|---|---|---|---|
| H00 | No abnormality detected | — | — |
| H12 | Indoor/Outdoor capacity unmatched | continue for 90 sec. | • Indoor/outdoor connection wire<br>• Indoor/outdoor PCB<br>• Specification and combination table in catalogue |
| H15 | Outdoor compressor temperature sensor abnormality | Continue for 90 sec. | • Compressor temperature sensor (defective or disconnected) |
| H23 | Indoor refrigerant liquid temperature sensor abnormality | Continue for 5 sec. | • Refrigerant liquid temperature sensor (defective or disconnected) |
| H42 | Compressor low pressure abnormality | — | • Outdoor pipe temperature sensor<br>• Clogged expansion valve or strainer<br>• Insufficient refrigerant<br>• Outdoor PCB<br>• Compressor |
| H62 | Water flow switch abnormality | 9 minutes after water pump ON and continue for 1 minute | • Water flow switch |
| H63 | Refrigerant low pressure abnormality | 4 times occurrence within 20 minutes | • Outdoor low pressure sensor (defective or disconnected) |
| H64 | Refrigerant high pressure abnormality | 4 times occurrence in 20 minutes | • Outdoor high pressure sensor (defective or disconnected) |
| H70 | Back-up heater OLP abnormality | Continue for 60 sec. | • Back-up heater OLP (Disconnection or activated) |
| H72 | Tank sensor abnormal | Continue for 5 sec. | • Tank sensor |
| H76 | Indoor - control panel communication abnormality | — | • Indoor - control panel (defective or disconnected) |
| H90 | Indoor/outdoor abnormal communication | > 1 min after starting operation | • Internal/external cable connections<br>• Indoor/Outdoor PCB |
| H91 | Tank heater OLP abnormality | Continue for 60 sec. | • Tank heater OLP (Disconnection or activated) |
| H95 | Indoor/Outdoor wrong connection | — | • Indoor/Outdoor supply voltage |
| H98 | Outdoor high pressure overload protection | — | • Outdoor high pressure sensor<br>• Water pump or water leakage<br>• Clogged expansion valve or strainer<br>• Excess refrigerant<br>• Outdoor PCB |
| H99 | Indoor heat exchanger freeze prevention | Continue for 10 sec. | • Indoor heat exchanger<br>• Refrigerant shortage |
| F12 | Pressure switch activate | 4 times occurrence within 20 minutes | • Pressure switch |
| F14 | Outdoor compressor abnormal revolution | 4 times occurrence within 20 minutes | • Outdoor compressor |
| F15 | Outdoor fan motor lock abnormality | 2 times occurrence within 20 minutes | • Outdoor PCB<br>• Outdoor fan motor |
| F16 | Total running current protection | 3 times occurrence within 20 minutes | • Excess refrigerant<br>• Outdoor PCB |
| F20 | Outdoor compressor overheating protection | 4 times occurrence within 30 minutes | • Compressor tank temperature sensor<br>• Clogged expansion valve or strainer<br>• Insufficient refrigerant<br>• Outdoor PCB<br>• Compressor |
| F22 | IPM (power transistor) overheating protection | 3 times occurrence within 30 minutes | • Improper heat exchange<br>• IPM (Power transistor) |
| F23 | Outdoor Direct Current (DC) peak detection | 7 times occurrence continuously | • Outdoor PCB<br>• Compressor |
| F24 | Refrigeration cycle abnormality | 2 times occurrence within 20 minutes | • Insufficient refrigerant<br>• Outdoor PCB<br>• Compressor low compression |
| F25 | Cooling/Heating cycle changeover abnormality | 4 times occurrence within 30 minutes | • 4-way valve<br>• V-coil |
| F37 | Indoor water inlet temperature sensor abnormality | Continue for 5 sec. | • Water inlet temperature sensor (defective or disconnected) |
| F40 | Outdoor discharge pipe temperature sensor abnormality | Continue for 5 sec. | • Outdoor discharge pipe temperature sensor (defective or disconnected) |
| F41 | PFC control | 4 times occurrence within 10 minutes | • Voltage at PFC |
| F42 | Outdoor heat exchanger temperature sensor abnormality | Continue for 5 sec. | • Outdoor heat exchanger temperature sensor (defective or disconnected) |

| Diagnosis display | Abnormality/Protection control | Abnormality judgement | Primary location to verify |
|---|---|---|---|
| F43 | Outdoor defrost sensor abnormality | Continue for 5 sec. | • Outdoor defrost sensor (defective or disconnected) |
| F45 | Indoor water outlet temperature sensor abnormality | Continue for 5 sec. | • Water outlet temperature sensor (defective or disconnected) |
| F46 | Outdoor Current Transformer open circuit | — | • Insufficient refrigerant<br>• Outdoor PCB<br>• Compressor low |
| F48 | Outdoor EVA outlet temperature sensor abnormality | Continue for 5 sec. | • Outdoor EVA outlet temperature sensor (defective or disconnected) |
| F49 | Outdoor bypass outlet temperature sensor abnormality | Continue for 5 sec. | • Outdoor bypass outlet temperature sensor (defective or disconnected) |
| F95 | Cooling high pressure overload protection | 4 times occurrence in 20 minutes. | • Outdoor high pressure sensor<br>• Water pump or water leakage<br>• Clogged expansion valve or strainer<br>• Excess refrigerant<br>• Outdoor PCB |

## *16.5 Self-diagnosis Method*

### 16.5.1 Connection Capability Rank Abnormality (H12)

**Malfunction Decision Conditions:**

During startup operation of heating, the capability rank of indoor checked by the outdoor is used to determine connection capability rank abnormality.

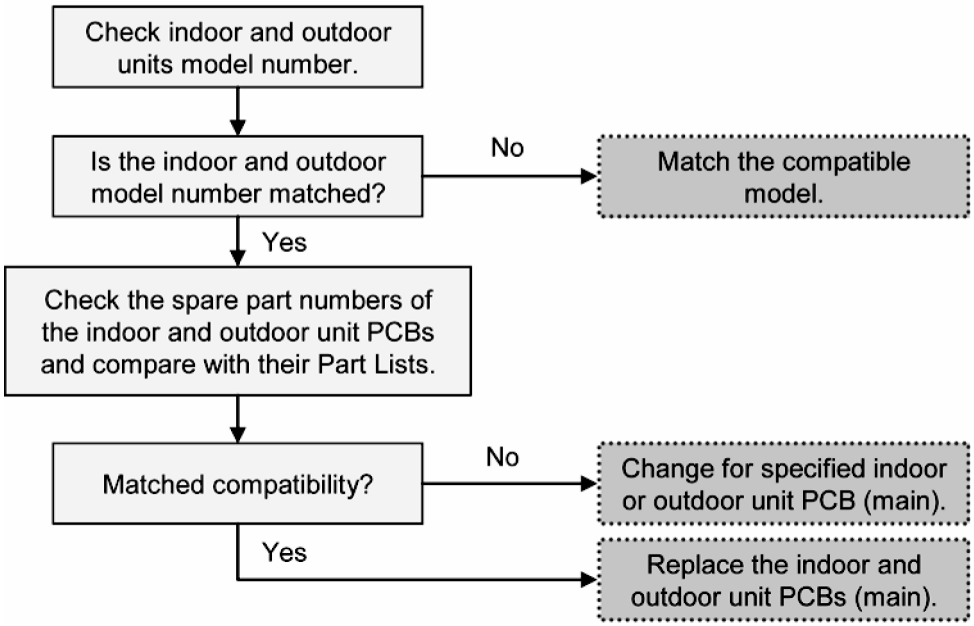
**Malfunction Caused:**

1 Wrong model interconnected.
2 Wrong indoor unit or outdoor unit PCB (main) used.
3 Faulty indoor unit or outdoor unit PCB (main).

**Abnormality Judgment:**

Continue for 90 seconds.

**Troubleshooting:**



## 16.5.2 Compressor Tank Temperature Sensor Abnormality (H15)

**Malfunction Decision Conditions:**

During startup and operation of heating, the temperatures detected by the compressor tank temperature sensor are used to determine sensor error.

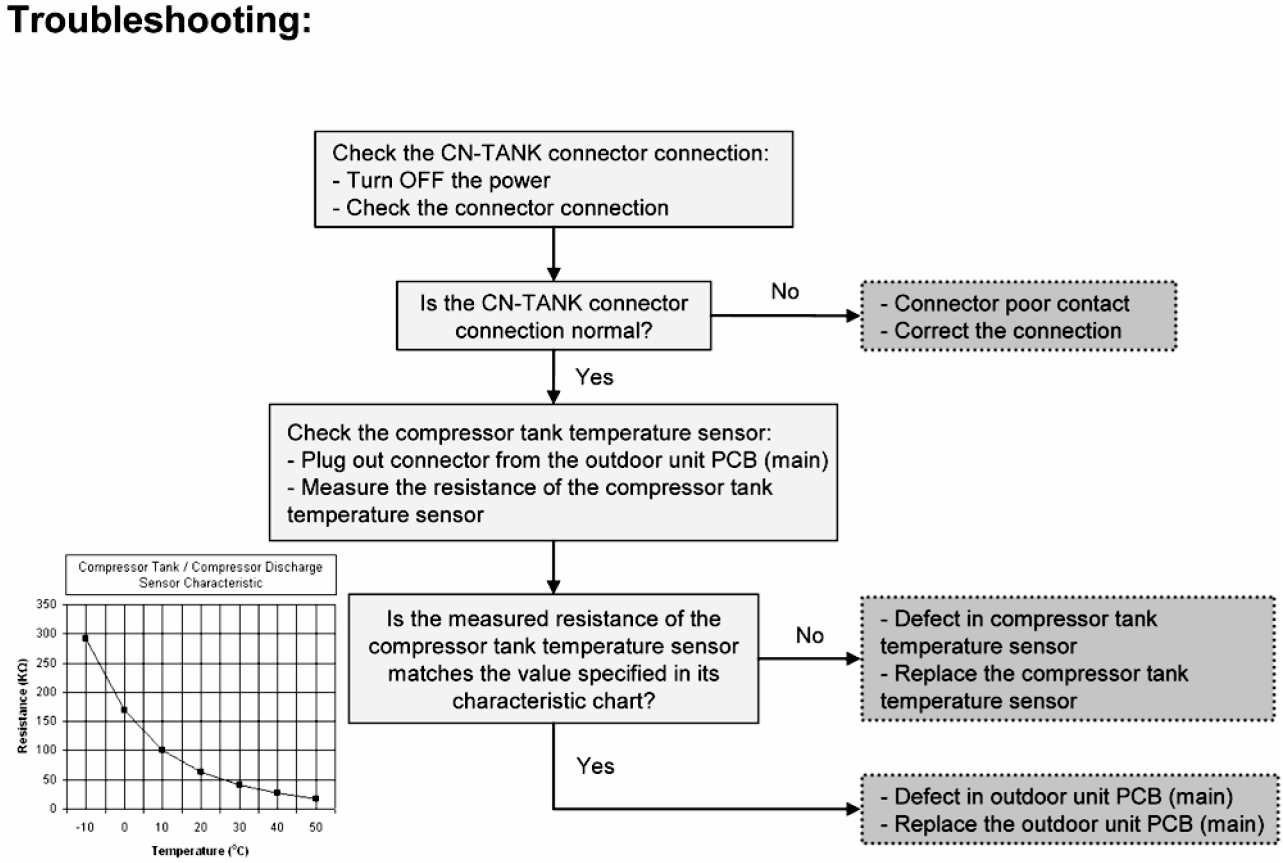
**Malfunction Caused:**

1 Faulty connector connection.
2 Faulty sensor.
3 Faulty outdoor unit PCB (main).

**Abnormality Judgment:**

Continue for 5 seconds.

## Troubleshooting:



### 16.5.3 Indoor Refrigerant Liquid Temperature Sensor Abnormality (H23)

**Malfunction Decision Conditions:**

During startup and operation of heating, the temperatures detected by the indoor refrigerant liquid temperature sensor are used to determine sensor error.

**Malfunction Caused:**

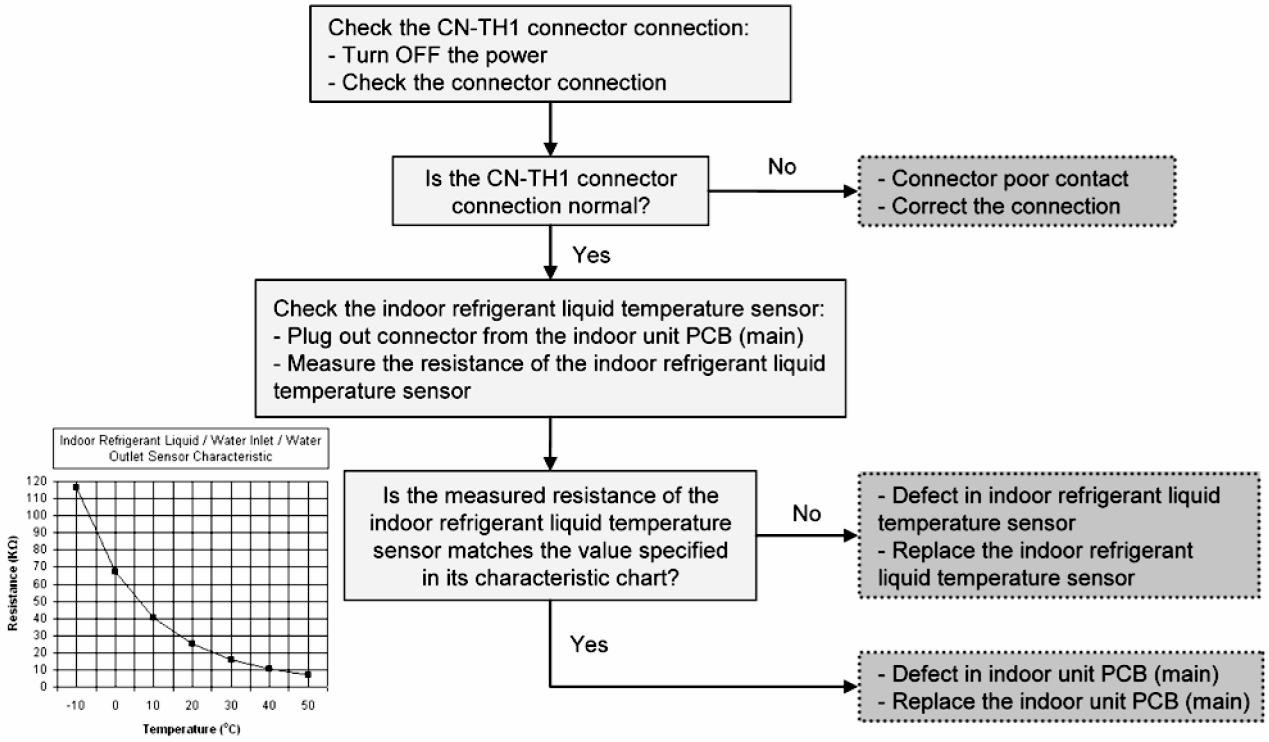
1 Faulty connector connection.
2 Faulty sensor.
3 Faulty indoor unit PCB (main).

**Abnormality Judgment:**

Continue for 5 seconds.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.4 Compressor Low Pressure Protection (H42)

**Malfunction Decision Conditions:**

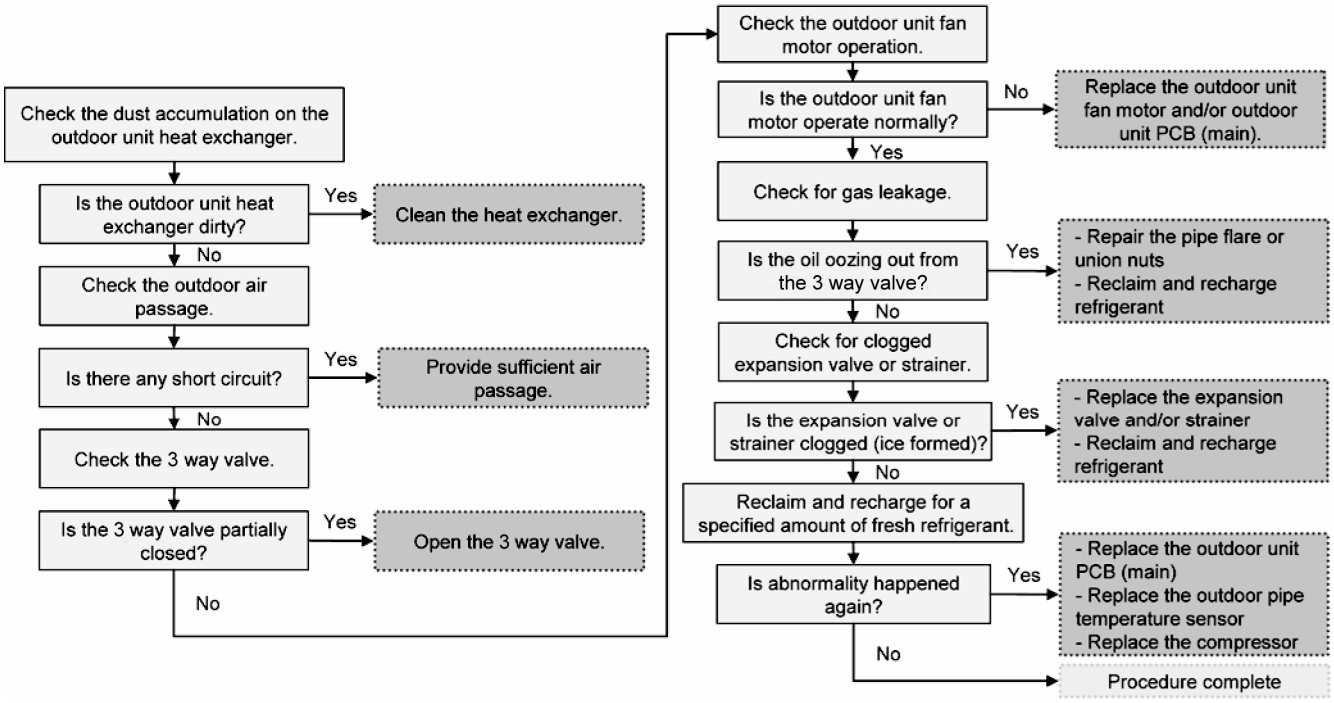
During operation of heating and after 5 minutes compressor ON, when outdoor pipe temperature below -29°C or above 26°C is detected by the outdoor pipe temperature sensor.

**Malfunction Caused:**

1 Dust accumulation on the outdoor unit heat exchanger.
2 Air short circuit at outdoor unit.
3 3 way valve partially closed.
4 Faulty outdoor unit fan motor.
5 Refrigerant shortage (refrigerant leakage).
6 Clogged expansion valve or strainer.
7 Faulty outdoor pipe temperature sensor.
8 Faulty outdoor unit main PCB (main).

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.5 Water Flow Switch Abnormality (H62)

**Malfunction Decision Conditions:**

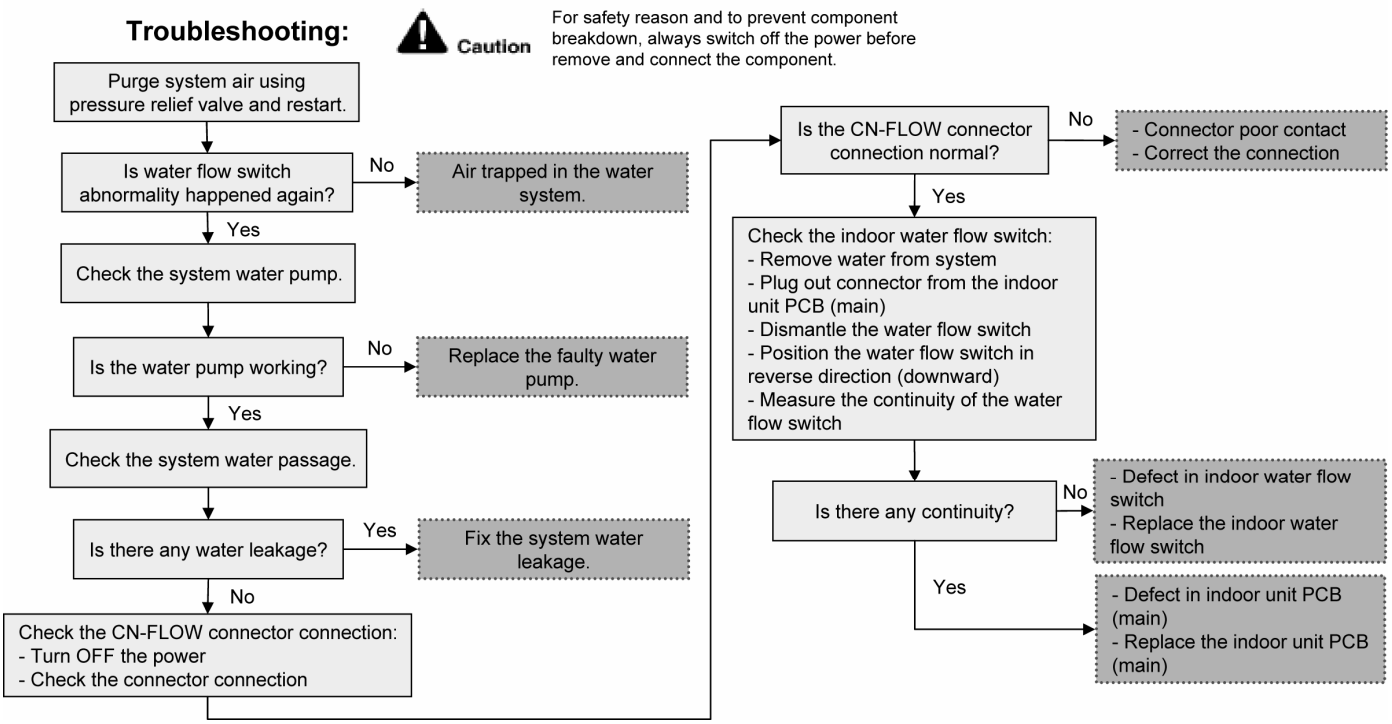
During operation of heating, the water flow detected by the indoor water flow switch is used to determine water flow error.

**Malfunction Caused:**

1 Air trapped in water system.
2 Faulty water pump.
3 Water leak in system.
4 Faulty connector connection.
5 Faulty water flow switch.
6 Faulty indoor unit PCB (main).

**Abnormality Judgment:**

Continue for 10 seconds (but no judgment for 9 minutes after compressor startup/restart).



## 16.5.6 Outdoor Low Pressure Abnormality (H63)

**Malfunction Decision Conditions:**

During operation of heating, when the outdoor low pressure sensor output signal is 0Vdc or 5Vdc.

**Malfunction Caused:**

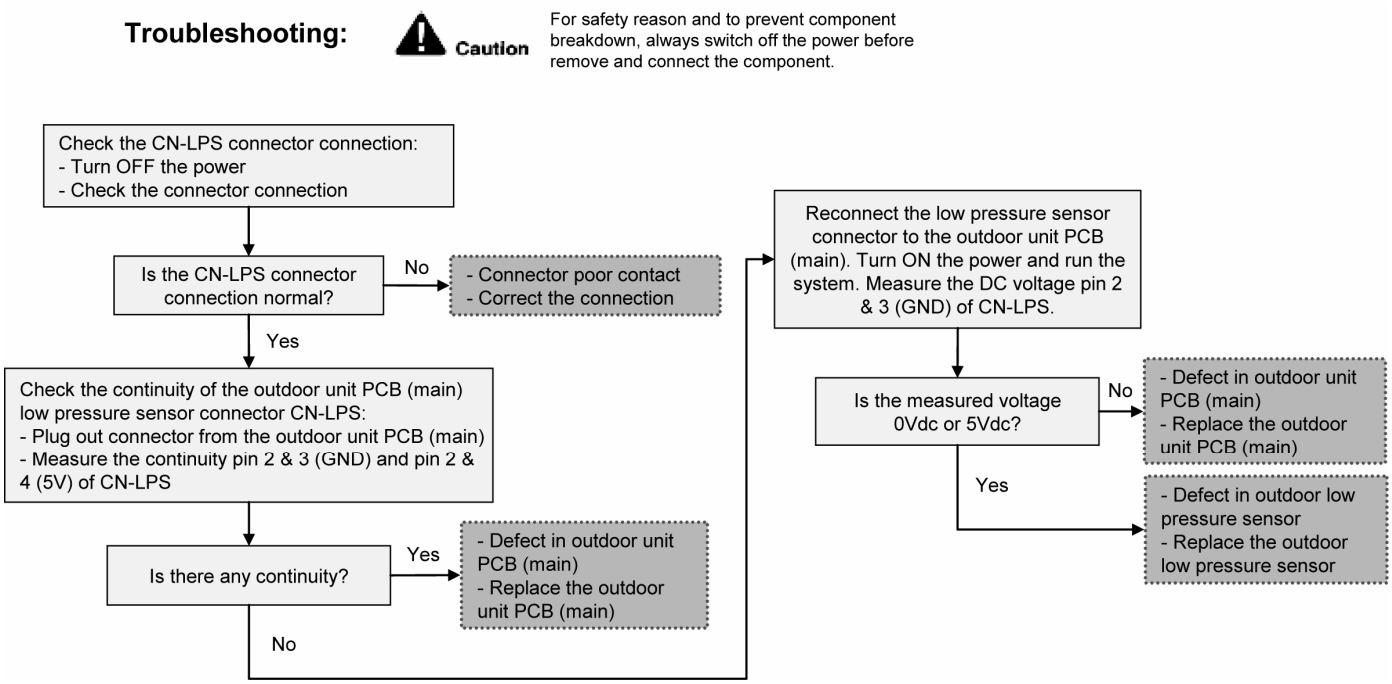
1 Faulty connector connection.
2 Faulty sensor.
3 Faulty outdoor unit PCB (main).

**Abnormality Judgment:**

Continue 4 times in 20 minutes.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.7 Outdoor High Pressure Abnormality (H64)

**Malfunction Decision Conditions:**

During operation of heating, when the outdoor high pressure sensor output signal is 0Vdc or 5Vdc.

**Malfunction Caused:**

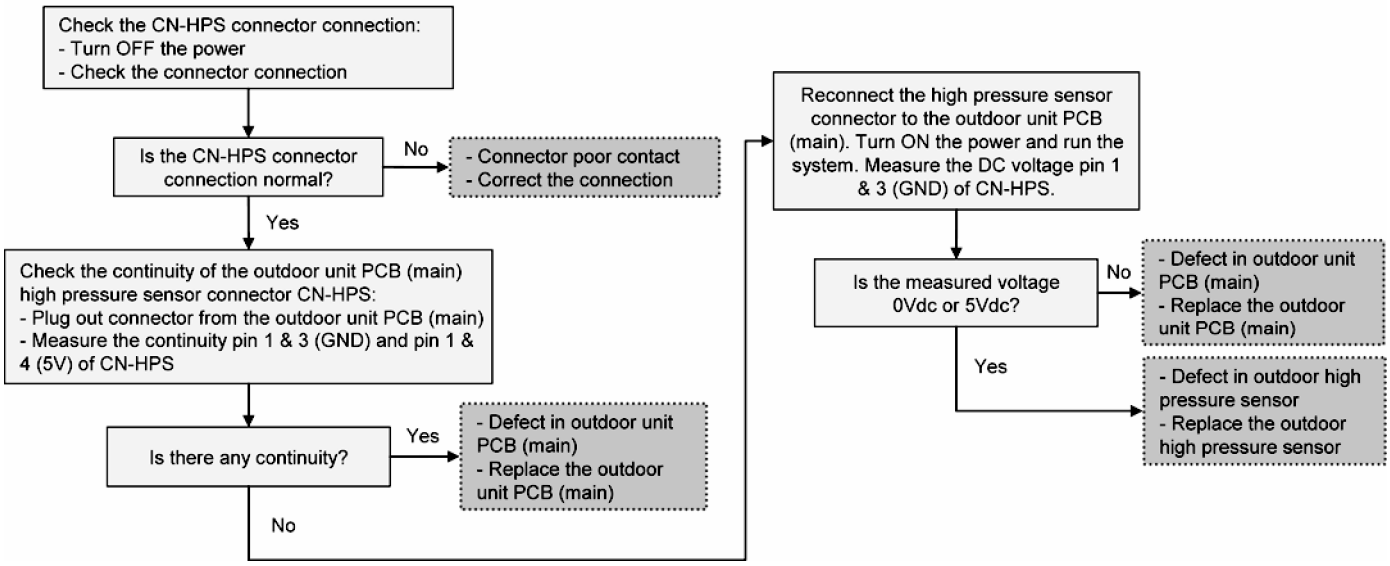
1 Faulty connector connection.
2 Faulty sensor.
3 Faulty outdoor unit PCB (main).

**Abnormality Judgment:**

Continue 4 times in 20 minutes.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.8 Indoor Backup Heater OLP Abnormality (H70)

**Malfunction Decision Conditions:**

During operation of indoor backup heater, when no power supplies to indoor backup heater or OLP open circuit.

**Malfunction Caused:**

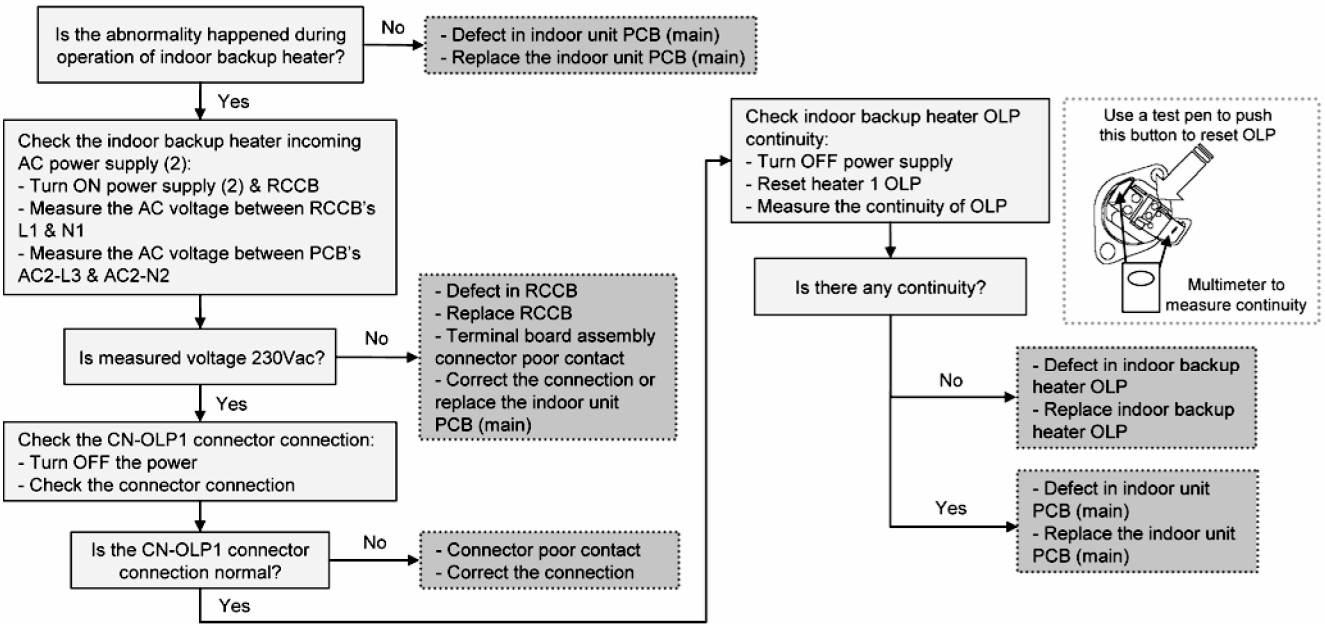
1 Faulty power supply connector connection.
2 Faulty connector connection.
3 Faulty indoor backup heater overload protector (OLP).
4 Faulty indoor unit PCB (main).

**Abnormality Judgment:**

Continue for 60 seconds.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.9 Tank Temperature Sensor Abnormality (H72)

**Malfunction Decision Conditions:**

When tank connection is set to ON, the temperatures detected by the tank temperature sensor are used to determine sensor error.

**Malfunction Caused:**

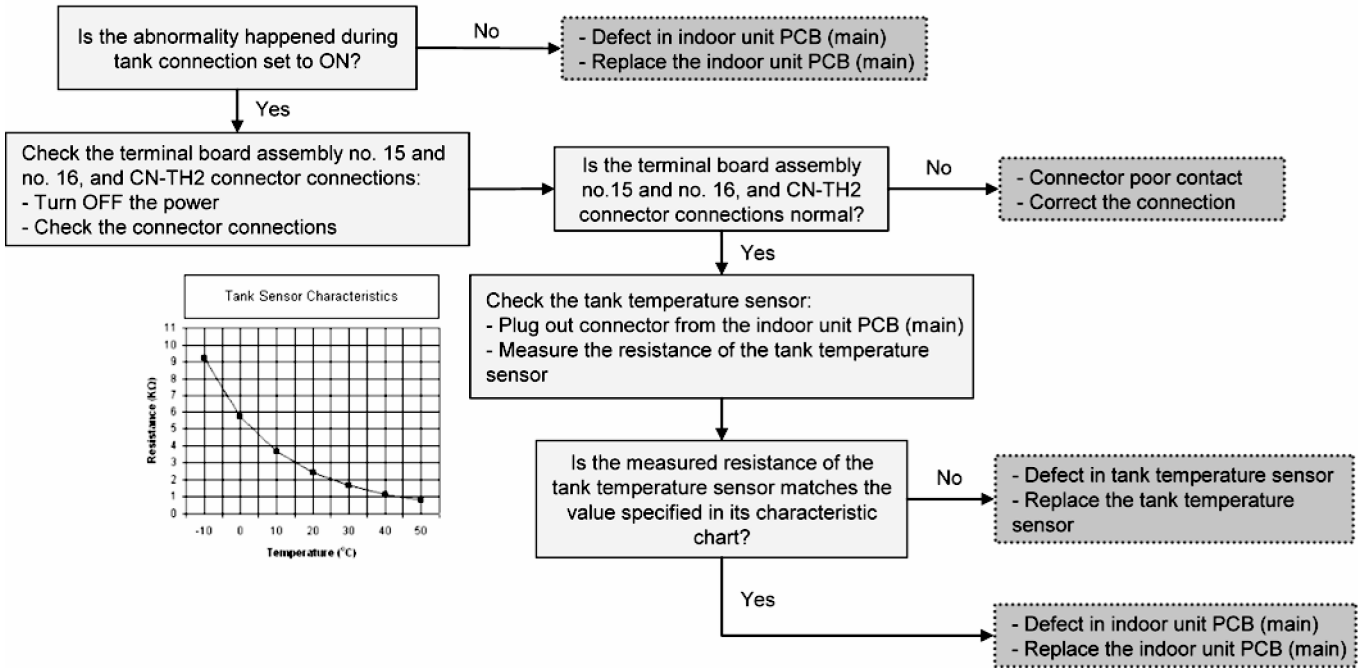
1 Faulty connector connection.
2 Faulty sensor.
3 Faulty indoor unit PCB (main).

**Abnormality Judgment:**

Continue for 5 seconds.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.10 Indoor-Control Panel Communication Abnormality (H76)

**Malfunction Decision Conditions:**

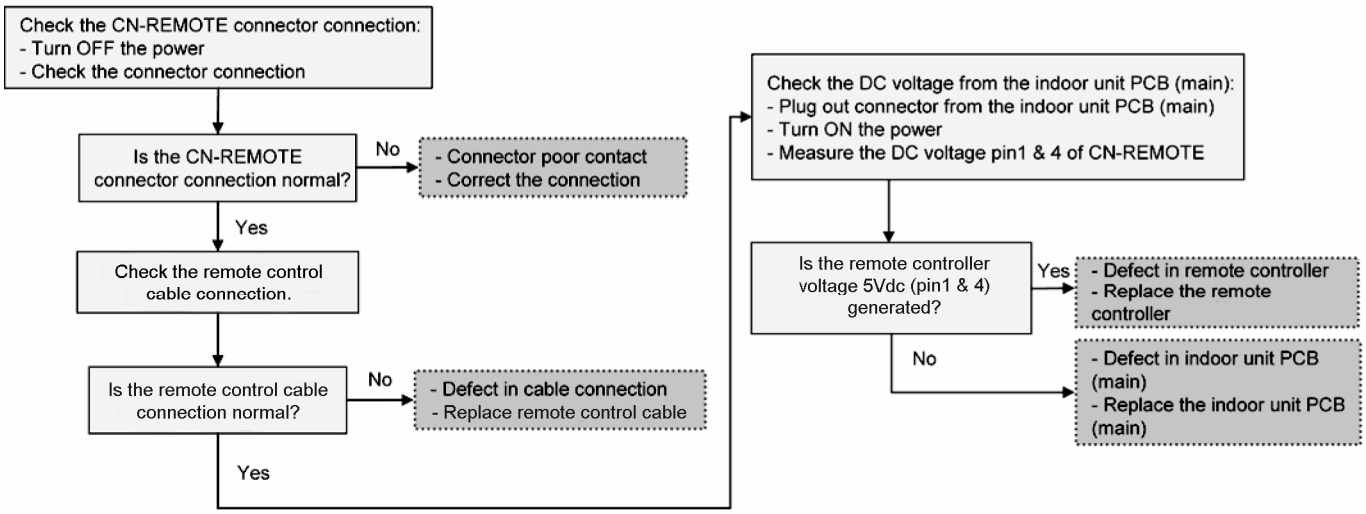
During standby and operation of heating, indoor-remote control error occur.

**Malfunction Caused:**

1 Faulty connector connection.
2 Faulty remote control.
3 Faulty indoor unit PCB (main).

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.11 Indoor/Outdoor Abnormal Communication (H90)

**Malfunction Decision Conditions:**

During operation of heating, the data received from outdoor unit in indoor unit signal transmission is checked whether it is normal.

**Malfunction Caused:**

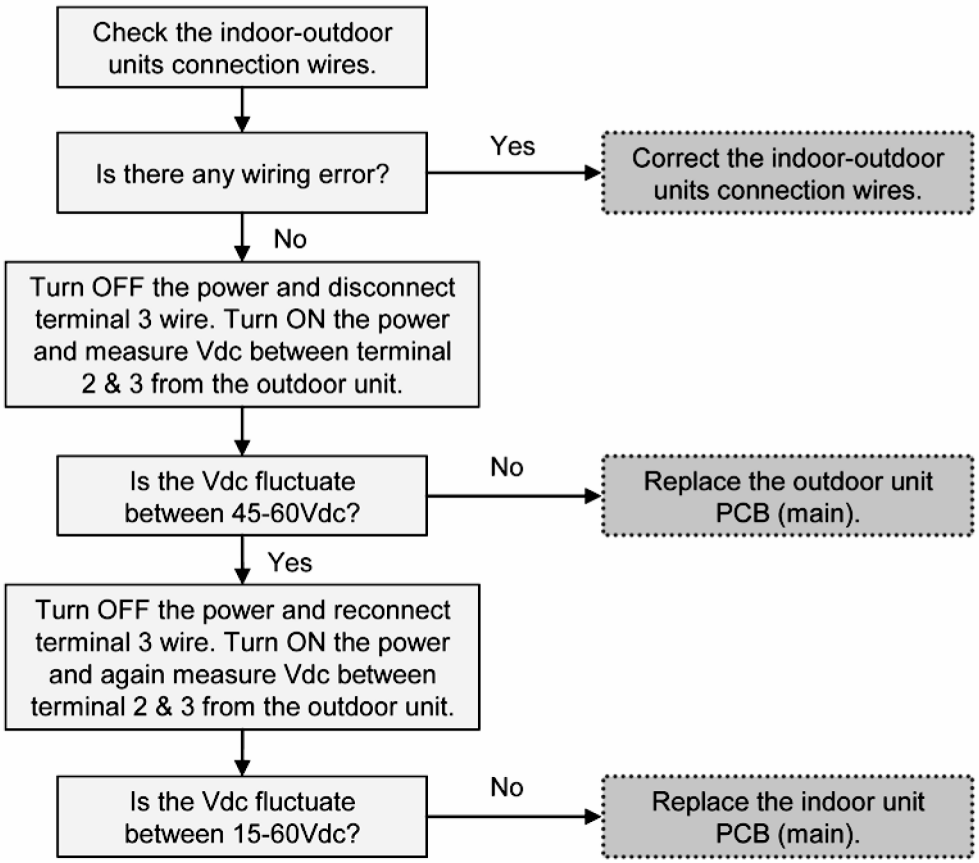
1 Faulty outdoor unit PCB (main).
2 Faulty indoor unit PCB (main).
3 Indoor-outdoor signal transmission error due to wrong wiring.
4 Indoor-outdoor signal transmission error due to breaking of wire in the connection wires between the indoor and outdoor units.
5 Indoor-outdoor signal transmission error due to disturbed power supply waveform.

**Abnormality Judgment:**

Continue for 1 minute after operation.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.12 Tank Booster Heater OLP Abnormality (H91)

**Malfunction Decision Conditions:**

During operation of tank booster heater, and tank booster heater OLP open circuit.

**Malfunction Caused:**

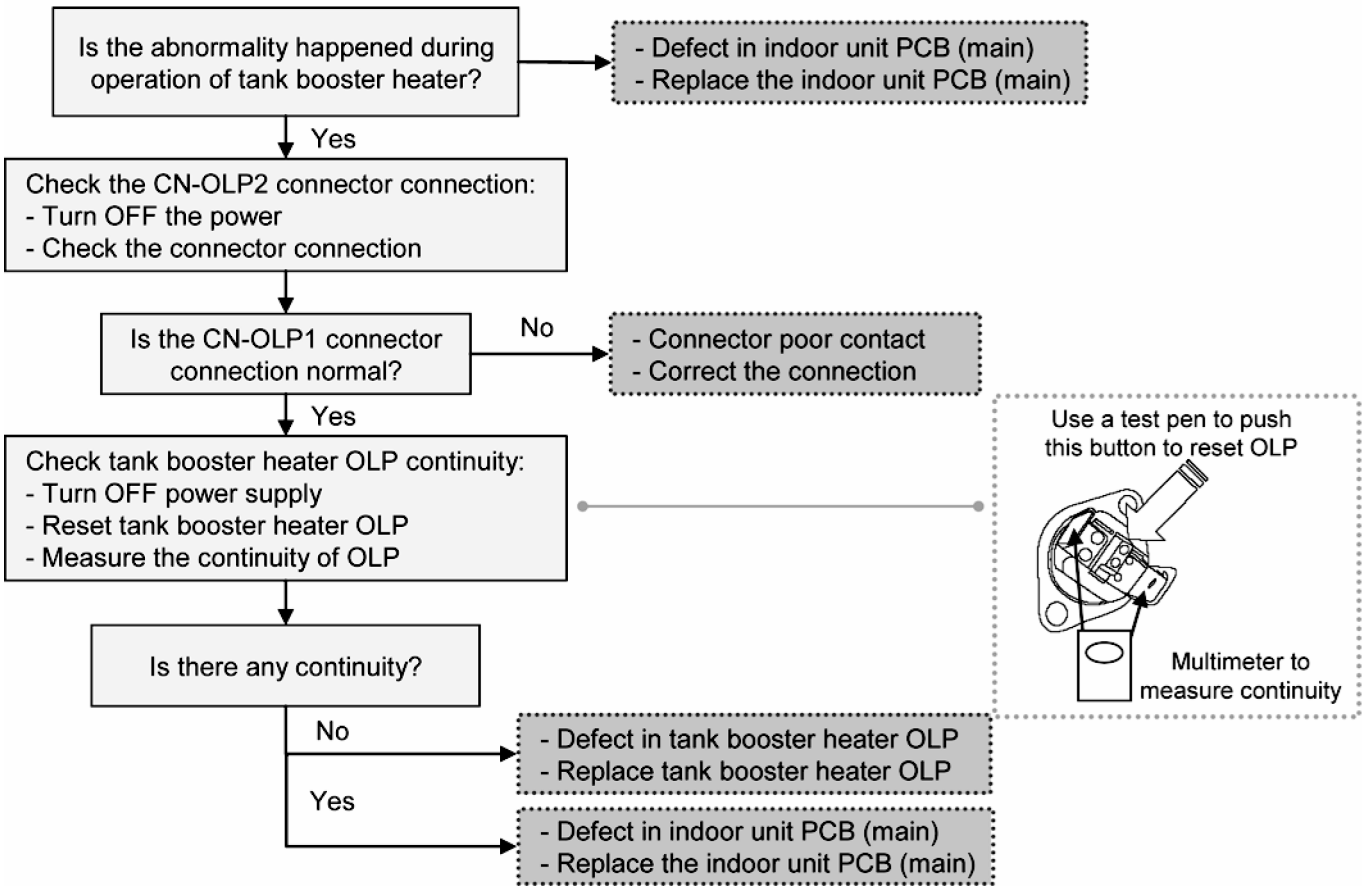
1 Faulty connector connection.
2 Faulty tank booster heater overload protector (OLP).
3 Faulty indoor unit PCB (main).

**Abnormality Judgment:**

Continue for 60 seconds.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.13 Unspecified Voltage between Indoor and Outdoor (H95)

**Malfunction Decision Conditions:**

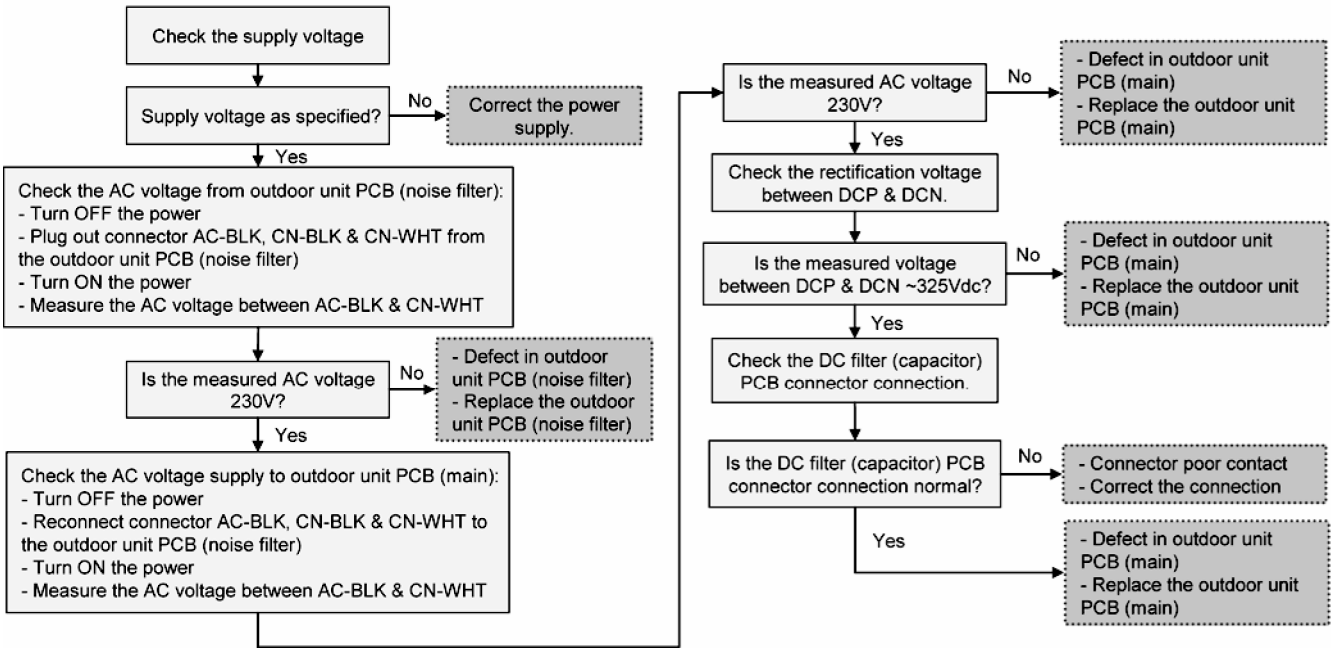
The supply power is detected for its requirement by the indoor/outdoor transmission.

**Malfunction Caused:**

1 Insufficient power supply.
2 Faulty outdoor unit PCB (noise filter/main).

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.14 Outdoor High Pressure Protection (H98)

**Malfunction Decision Conditions:**

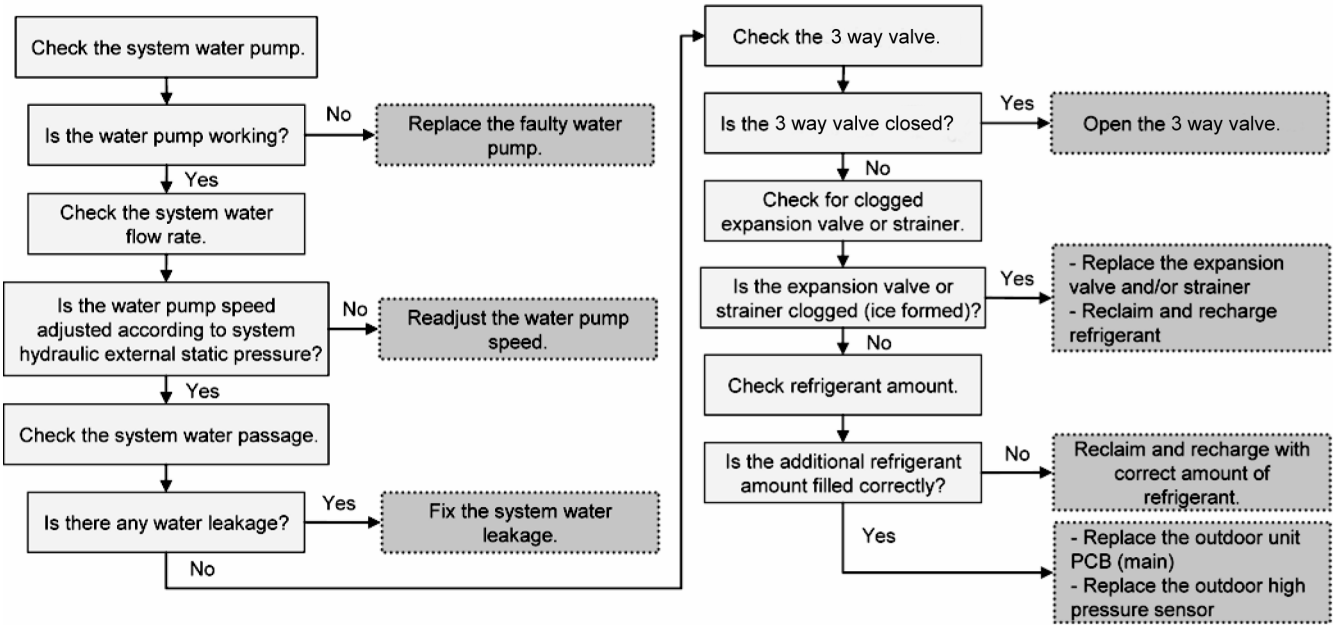
During operation of heating, when pressure 4.0 MPa and above is detected by outdoor high pressure sensor.

**Malfunction Caused:**

1 Faulty water pump.
2 Insufficient water flow rate in system.
3 Water leak in system.
4 3 way closed.
5 Clogged expansion valve or strainer.
6 Excessive refrigerant.
7 Faulty outdoor high pressure sensor.
8 Faulty outdoor unit PCB (main).

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.15 Indoor Freeze-up Protection (H99)

**Malfunction Decision Conditions:**

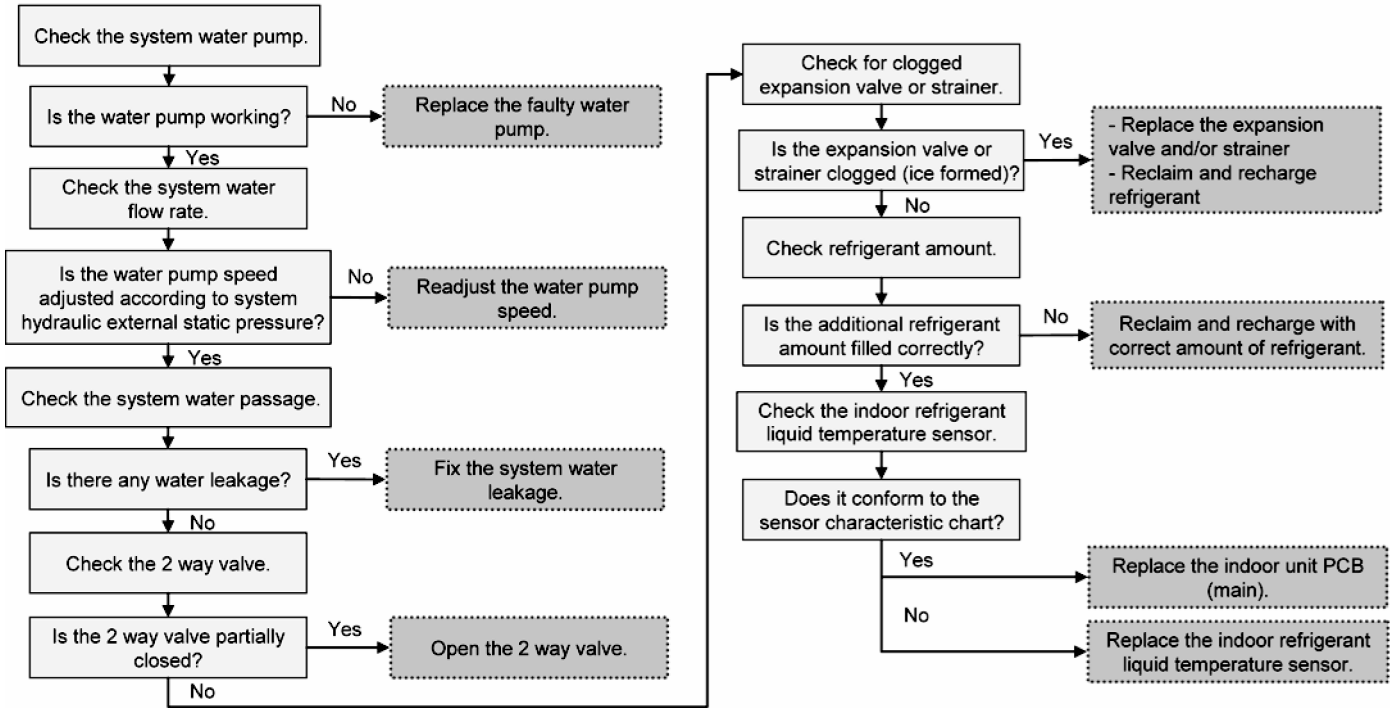
During anti-freezing control in cooling operation, when the indoor refrigerant liquid temperature < 0°C.

**Malfunction Caused:**

1 Faulty water pump.
2 Insufficient water flow rate in system.
3 Water leak in system.
4 2 way valve partially closed.
5 Clogged expansion valve or strainer.
6 Refrigerant shortage (refrigerant leakage).
7 Faulty indoor refrigerant liquid temperature sensor.
8 Faulty indoor unit PCB (main).

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.16 Outdoor High Pressure Switch Activate (F12)

**Malfunction Decision Conditions:**

During operation of heating, when pressure 4.5MPa and above is detected by outdoor high pressure switch.

**Malfunction Caused:**

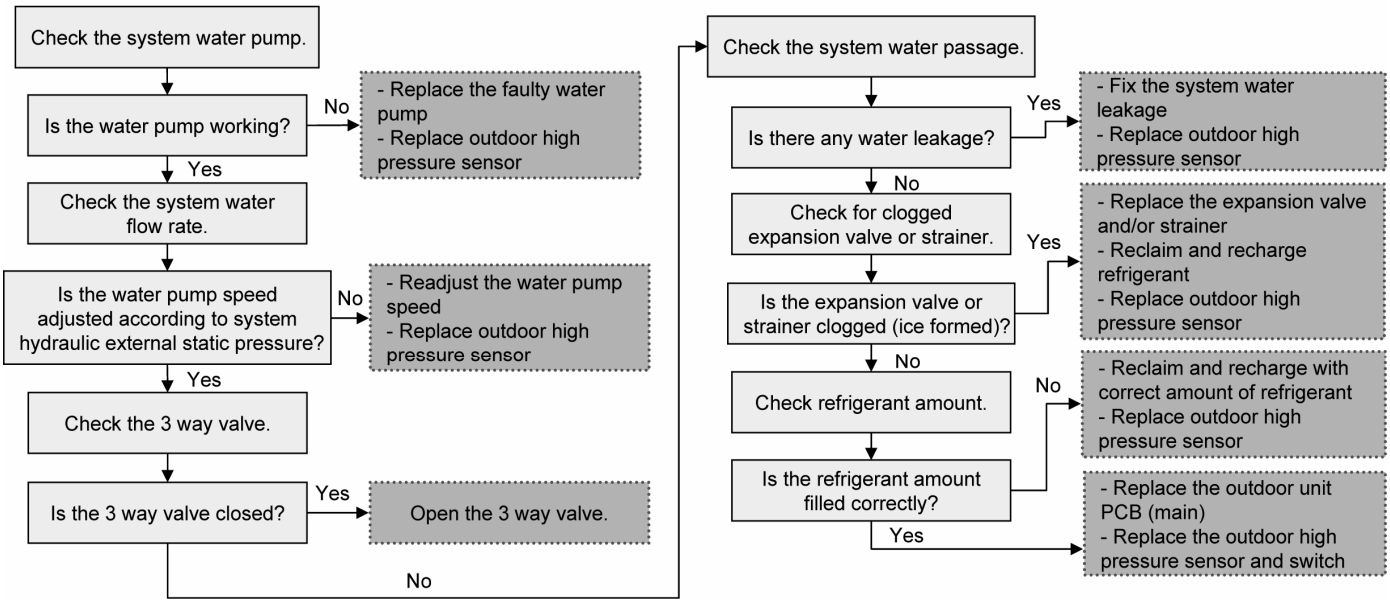
1 Faulty water pump.
2 Insufficient water flow rate in system.
3 Water leak in system.
4 3 way valve closed.
5 Clogged expansion valve or strainer.
6 Excessive refrigerant.
7 Faulty outdoor high pressure sensor and switch.
8 Faulty outdoor unit PCB.

**Abnormality Judgment:**

Continue 4 times in 20 minutes.

**Troubleshooting:**

Caution For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.17 Compressor Rotation Failure (F14)

**Malfunction Decision Conditions:**

A compressor rotation failure is detected by checking the compressor running condition through the position detection circuit.

**Malfunction Caused:**

1 Compressor terminal disconnect.
2 Faulty outdoor unit PCB (main).
3 Faulty compressor.

**Abnormality Judgment:**

Continue 4 times in 20 minutes.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.

Check the U, V, and W connector connection:
- Turn OFF the power
- Check the U, V, and W connector connection at outdoor unit PCB (main) and compressor terminal

Is the connector connection normal?

No → - Connector poor contact
- Correct the connection

Yes

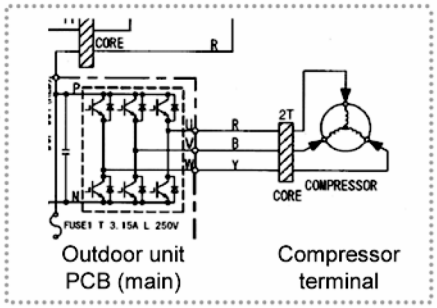
Disconnect the harnesses U, V, and W from the compressor terminal.

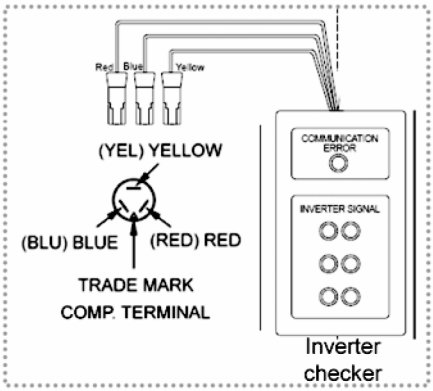
From the disconnected harnesses U, Y, and W, connect them to the inverter checker. Turn ON the power and operate the system. Check the inverter checker 6 LEDs blinking condition.

Is the blinking of the 6 LEDs in same sequence/condition?

No → - IPM defective
- Replace the outdoor unit PCB (main)

Yes → Replace the compressor.



## 16.5.18 Outdoor Fan Motor (DC Motor) Mechanism Locked (F15)

**Malfunction Decision Conditions:**

The rotation speed detected by the Hall IC of the fan motor during fan motor operation is used to determine abnormal fan motor (feedback of rotation > 2550rpm or < 50rpm).

**Malfunction Caused:**

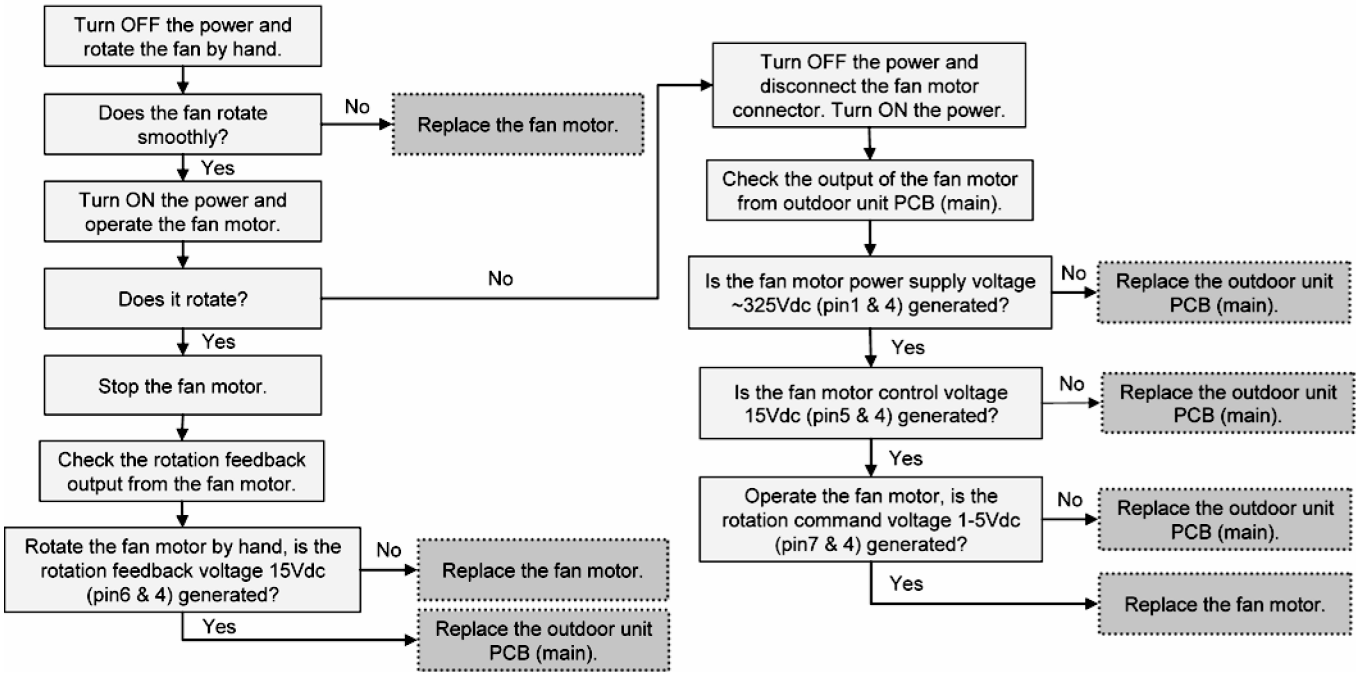
1 Operation stop due to short circuit inside the fan motor winding.
2 Operation stop due to breaking of wire inside the fan motor.
3 Operation stop due to breaking of fan motor lead wires.
4 Operation stop due to fan motor Hall IC malfunction.
5 Operation error due to faulty outdoor unit PCB.

**Abnormality Judgment:**

Continue 2 times in 30 minutes.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.19 Input Over Current Detection (F16)

**Malfunction Decision Conditions:**

During operation of heating, when outdoor current above 27.9A is detected by the current transformer (CT) in the outdoor unit PCB.

**Malfunction Caused:**

1 Excessive refrigerant.
2 Faulty outdoor unit PCB (main).

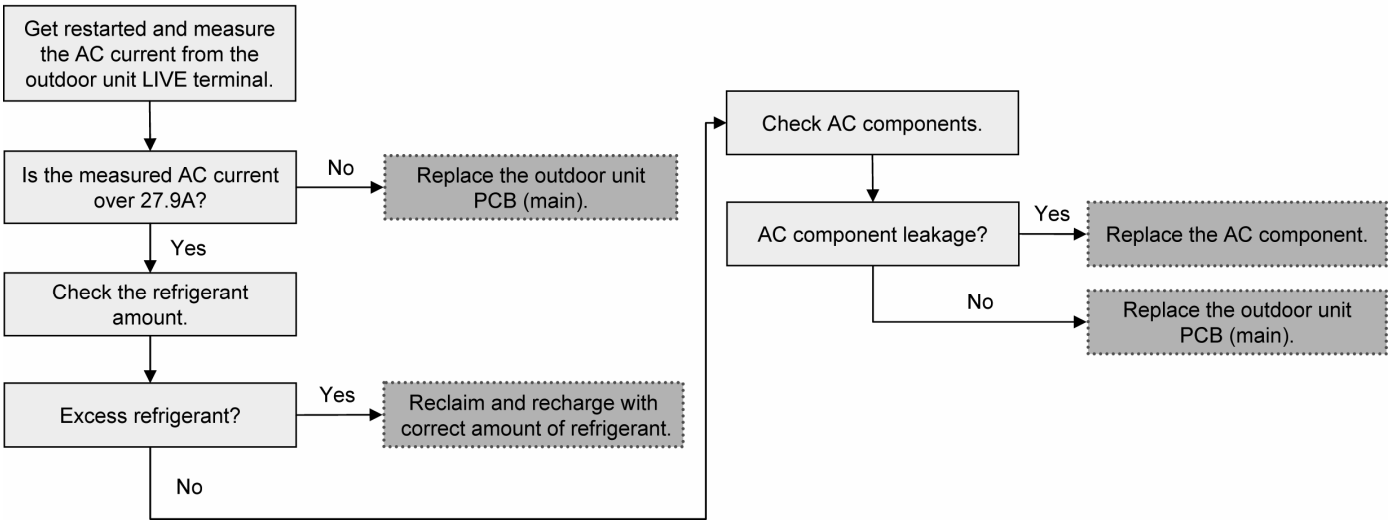
**Abnormality Judgment:**

Continue 3 times in 20 minutes.

**Troubleshooting:**

Caution

For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.20 Compressor Overheating (F20)

**Malfunction Decision Conditions:**

During operation of heating, when temperature above 112°C is detected by the compressor tank temperature sensor.

**Malfunction Caused:**

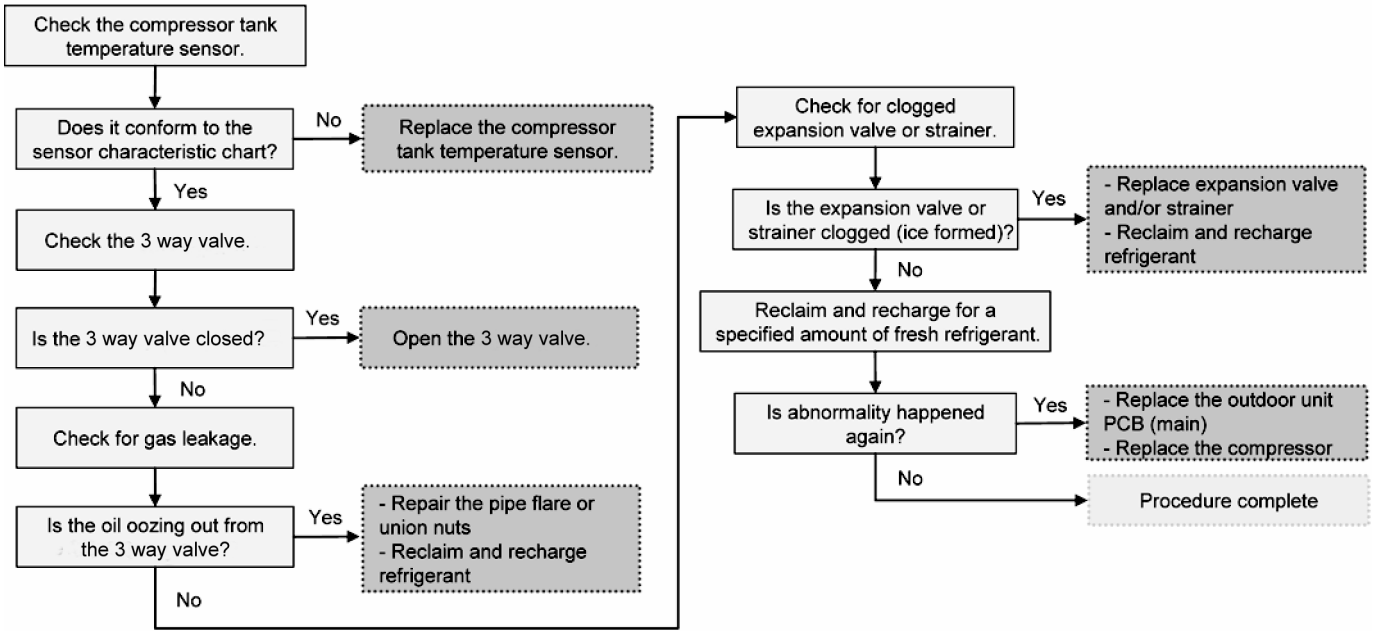
1 Faulty compressor tank temperature sensor.
2 3 way valve closed.
3 Refrigerant shortage (refrigerant leakage).
4 Clogged expansion valve or strainer.
5 Faulty outdoor unit PCB (main).
6 Faulty compressor.

**Abnormality Judgment:**

Continue 4 times in 30 minutes.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.21 IPM Overheating (F22)

**Malfunction Decision Conditions:**

During operation of heating, when temperature 95°C is detected by the outdoor IPM temperature sensor.

**Malfunction Caused:**

1 Faulty outdoor unit fan motor.
2 Faulty outdoor unit PCB (main).

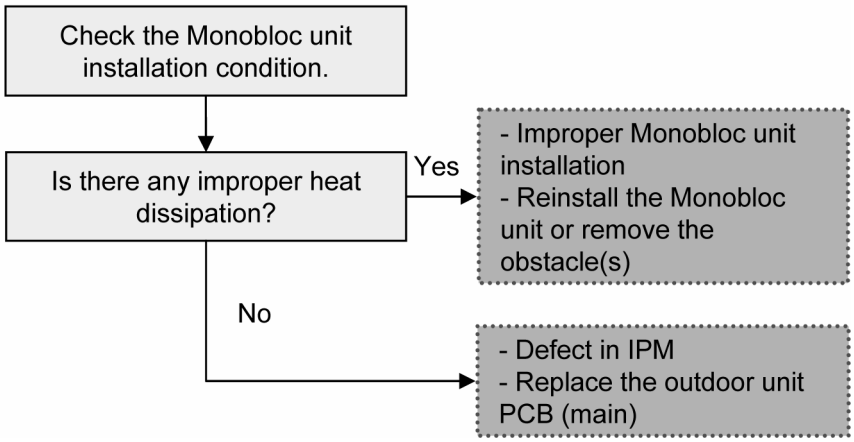
**Abnormality Judgment:**

Continue 3 times in 30 minutes.

**Troubleshooting:**

Caution

For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.22 Output Over Current Detection (F23)

**Malfunction Decision Conditions:**

During operation of heating, when outdoor DC current is above 40.1 ± 5.0A (for: 6kW~9kW) OR 44.7 ± 5.0A (for: 12kW~16kW) is detected by the IPM DC Peak sensing circuitry in the outdoor unit PCB (main).

**Malfunction Caused:**

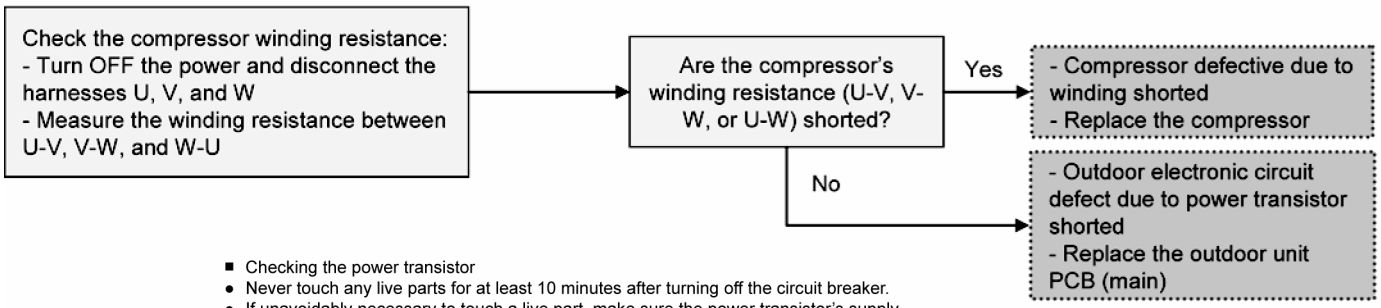
1 Faulty outdoor unit PCB (main).
2 Faulty compressor.

**Abnormality Judgment:**

Continue for 7 times.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.




- Checking the power transistor
- Never touch any live parts for at least 10 minutes after turning off the circuit breaker.
- If unavoidably necessary to touch a live part, make sure the power transistor's supply voltage is below 50 V using the tester.
- For the UVW, make measurements at the Faston terminal on the board or the relay connector.

| Tester's negative terminal | Power transistor (+) | UVW | Power transistor (–) | UVW |
|---|---|---|---|---|
| Tester's positive terminal | UVW | Power transistor (+) | UVW | Power transistor (–) |
| Normal resistance | Several kohms to several Mohms | | | |
| Abnormal resistance | 0 or ∞ | | | |

## 16.5.23 Refrigeration Cycle Abnormality (F24)

**Malfunction Decision Conditions:**

1 During operation of heating, compressor frequency > Frated.
2 During operation of heating, running current: 0.65A < I < 1.65A.
3 During operation of heating, indoor refrigerant liquid temperature - water inlet temperature < 5°C.

**Malfunction Caused:**

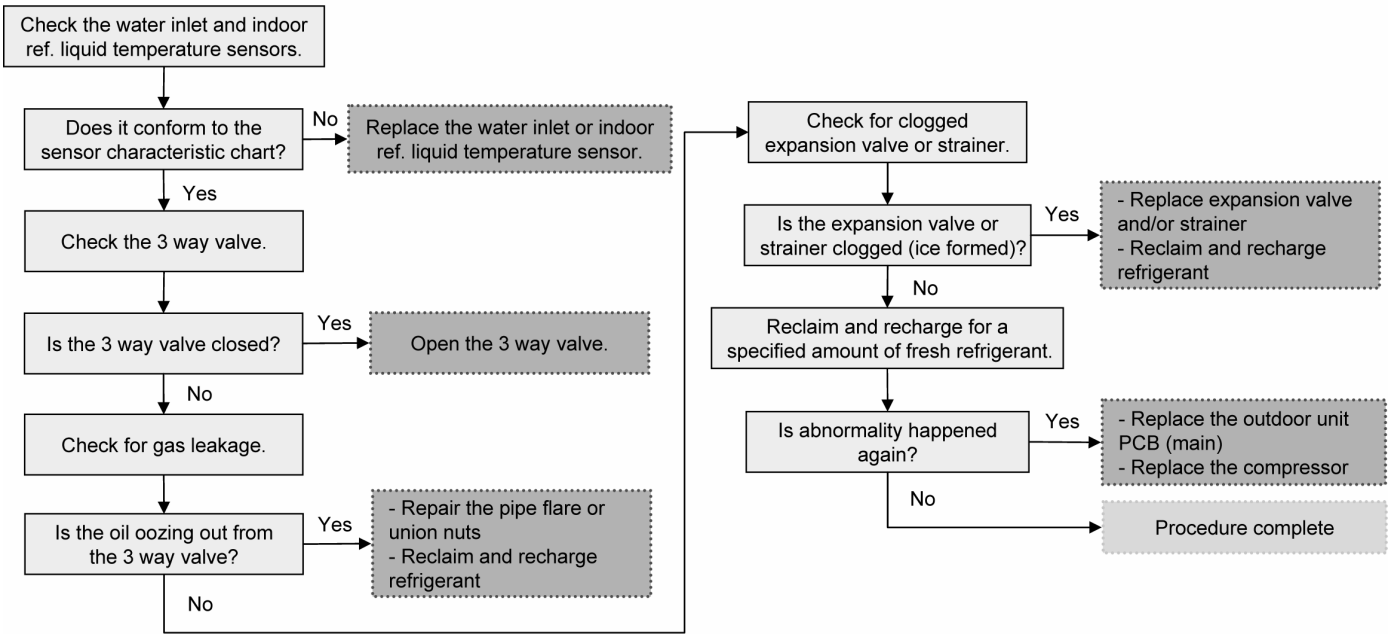
1 Faulty water inlet or indoor refrigerant liquid temperature sensors.
2 3 way valve closed.
3 Refrigerant shortage (refrigerant leakage).
4 Clogged expansion valve or strainer.
5 Faulty outdoor unit PCB (main).
6 Poor compression of compressor.

**Abnormality Judgment:**

Continue 2 times in 20 minutes.

**Troubleshooting:**

Caution For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.24 Four Way Valve Abnormality (F25)

**Malfunction Decision Conditions:**

During heating operation, when the indoor pipe temperature of thermostat ON indoor unit < 0°C.

**Malfunction Caused:**

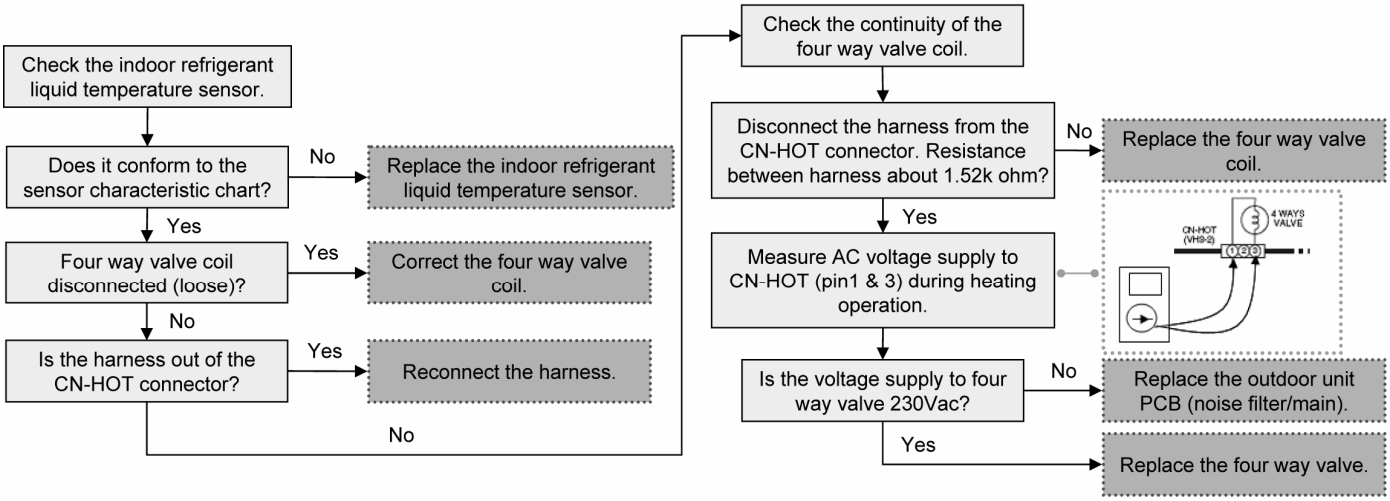
1 Faulty sensor.
2 Faulty connector connection.
3 Faulty outdoor unit PCB (noise filter/main).
4 Faulty four way valve.

**Abnormality Judgment:**

Continue 4 times in 30 minutes.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.25 Outdoor High Pressure Switch Abnormal (F27)

**Malfunction Decision Conditions:**

During compressor stop, and outdoor high pressure switch is remain opened.

**Malfunction Caused:**

1 Faulty connector connection.
2 Faulty switch.
3 Faulty outdoor unit PCB (main).

**Abnormality Judgment:**

Continue for 1 minute.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.

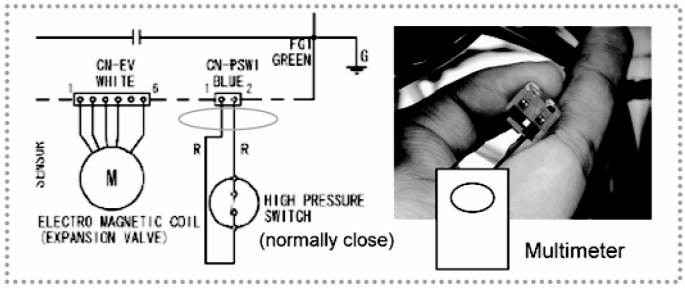
Check the CN-PSW1 connector connection:
- Turn OFF the power
- Check the connector connection

Is the CN-PSW1 connector connection normal?

No → - Connector poor contact
- Correct the connection

Yes

Check the continuity of the outdoor high pressure switch:
- Plug out outdoor high pressure switch connector from CN-PSW1 channel
- Measure the connector continuity




Is there any continuity?

Yes → - Defect in outdoor unit PCB (main)
- Replace the outdoor unit PCB (main)

No → - Defect in outdoor high pressure switch
- Replace the outdoor high pressure switch

## 16.5.26 Outdoor Air Temperature Sensor Abnormality (F36)

**Malfunction Decision Conditions:**

During startup and operation of heating, the temperatures detected by the outdoor air temperature sensor are used to determine sensor error.

**Malfunction Caused:**

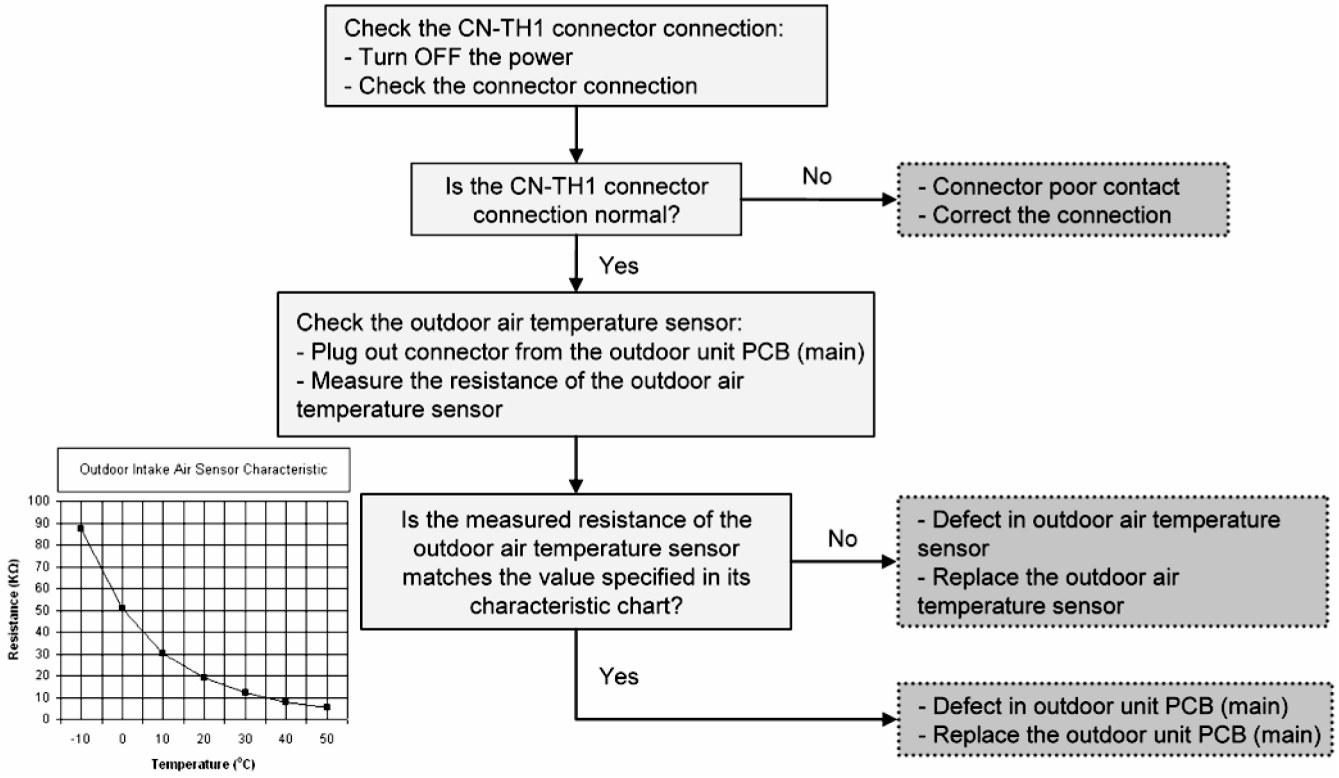
1 Faulty connector connection.
2 Faulty sensor.
3 Faulty outdoor unit PCB (main).

**Abnormality Judgment:**

Continue for 5 seconds.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.27 Indoor Water Inlet Temperature Sensor Abnormality (F37)

**Malfunction Decision Conditions:**

During startup and operation of heating, the temperatures detected by the indoor water inlet temperature sensor are used to determine sensor error.

**Malfunction Caused:**

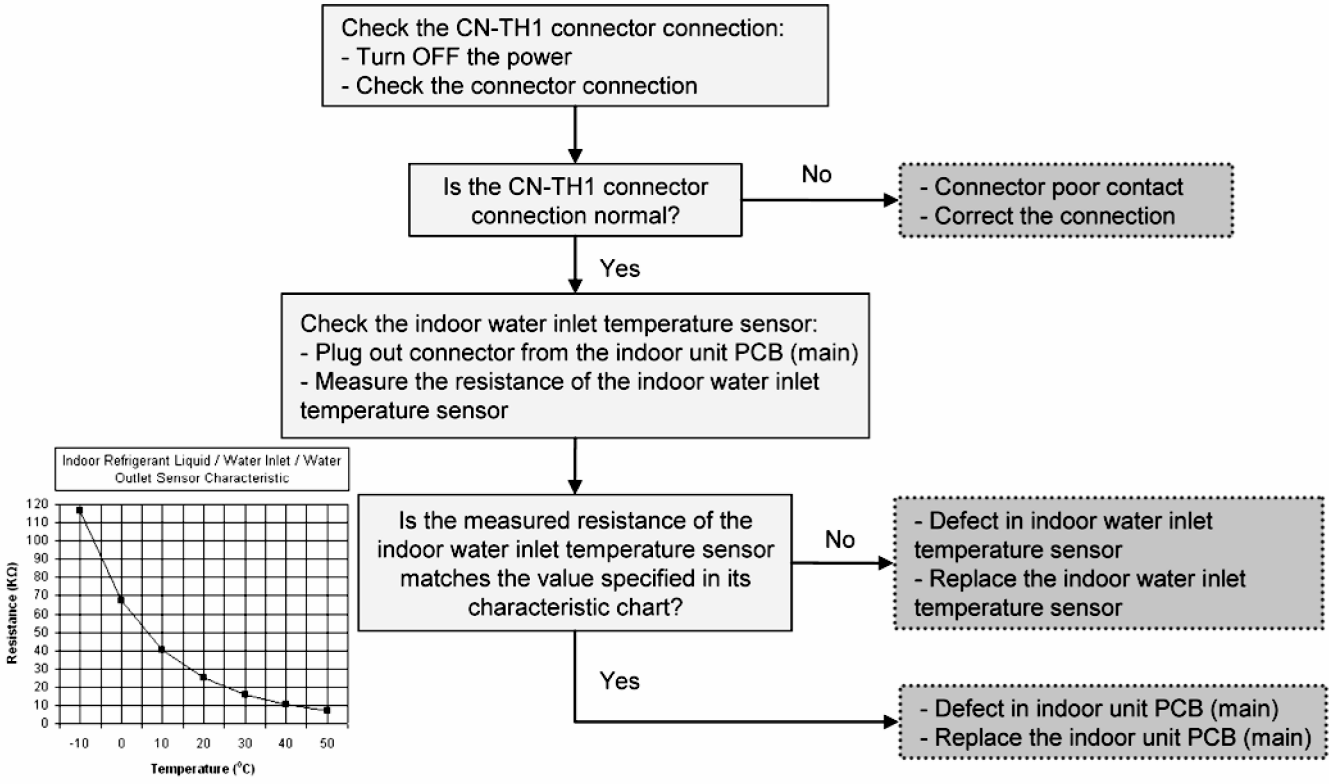
1 Faulty connector connection.
2 Faulty sensor.
3 Faulty indoor unit PCB (main).

**Abnormality Judgment:**

Continue for 5 seconds.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.28 Outdoor Discharge Pipe Temperature Sensor Abnormality (F40)

**Malfunction Decision Conditions:**

During startup and operation of heating, the temperatures detected by the outdoor discharge pipe temperature sensor are used to determine sensor error.

**Malfunction Caused:**

1 Faulty connector connection.
2 Faulty sensor.
3 Faulty outdoor unit PCB (main).

**Abnormality Judgment:**

Continue for 5 seconds.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.

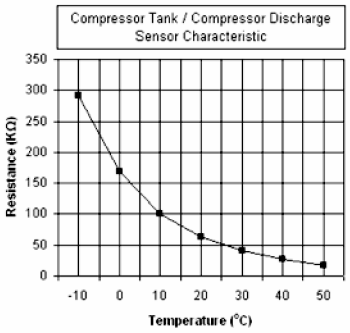
Check the CN-DIS connector connection:
- Turn OFF the power
- Check the connector connection

Is the CN-DIS connector connection normal?

No → - Connector poor contact
- Correct the connection

Yes

Check the outdoor discharge pipe temperature sensor:
- Plug out connector from the outdoor unit PCB (main)
- Measure the resistance of the outdoor discharge pipe temperature sensor




Is the measured resistance of the outdoor discharge pipe temperature sensor matches the value specified in its characteristic chart?

No → - Defect in outdoor discharge pipe temperature sensor
- Replace the outdoor discharge pipe temperature sensor

Yes → - Defect in outdoor unit PCB (main)
- Replace the outdoor unit PCB (main)

## 16.5.29 Power Factor Correction (PFC) Abnormality (F41)

**Malfunction Decision Conditions:**

During operation of heating, when the PFC protection circuitry in the outdoor unit PCB (main) senses abnormal high DC voltage level.

**Malfunction Caused:**

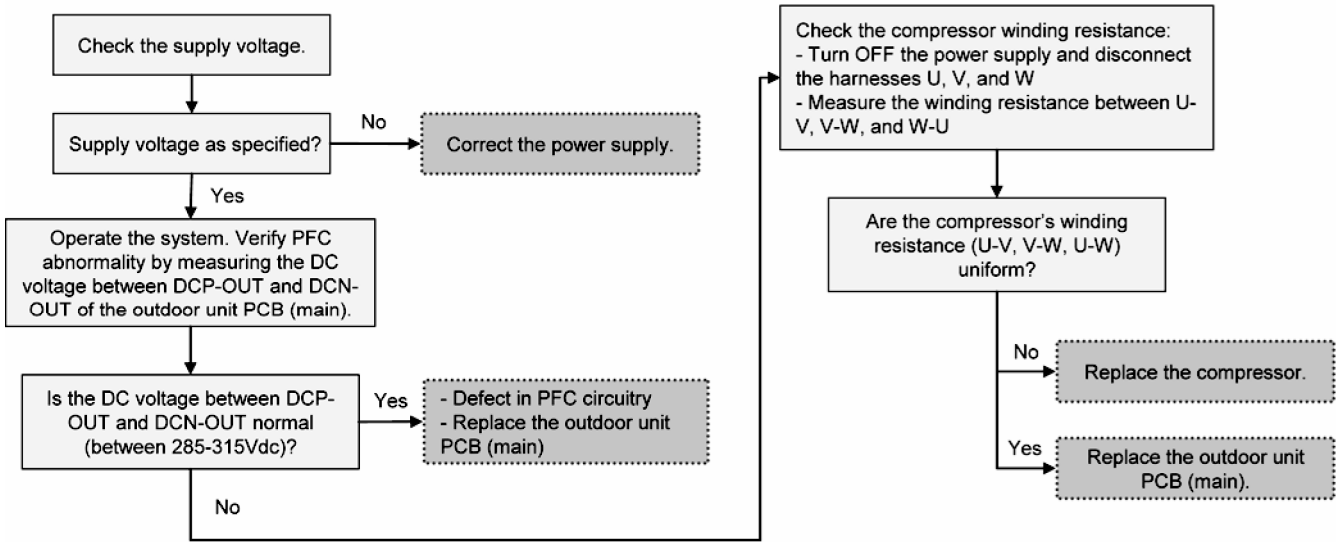
1 Power supply surge.
2 Compressor windings not uniform.
3 Faulty outdoor unit PCB (main).

**Abnormality Judgment:**

Continue 4 times in 10 minutes.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.30 Outdoor Pipe Temperature Sensor Abnormality (F42)

**Malfunction Decision Conditions:**

During startup and operation of heating, the temperatures detected by the outdoor pipe temperature sensor are used to determine sensor error.

**Malfunction Caused:**

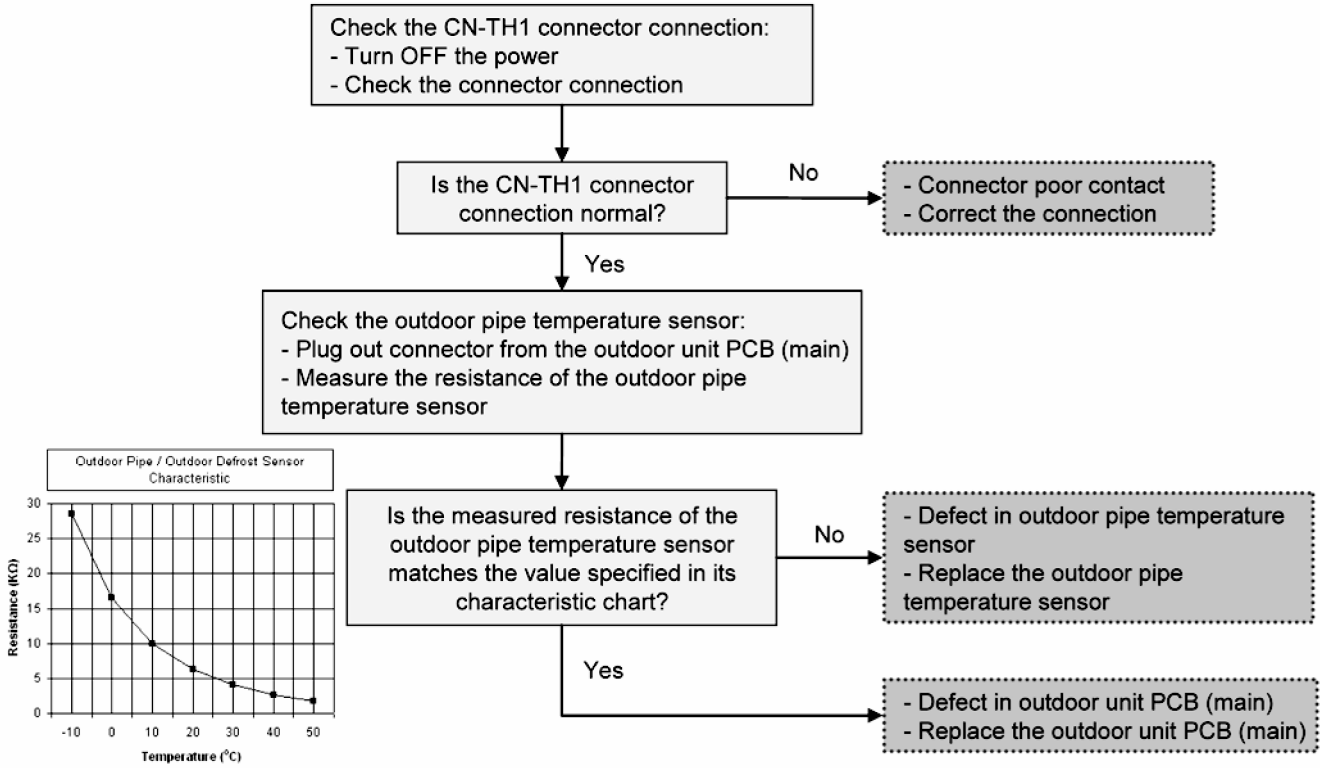
1 Faulty connector connection.
2 Faulty sensor.
3 Faulty outdoor unit PCB (main).

**Abnormality Judgment:**

Continue for 5 seconds.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.31 Outdoor Defrost Temperature Sensor Abnormality (F43)

**Malfunction Decision Conditions:**

During startup and operation of heating, the temperatures detected by the outdoor defrost temperature sensor are used to determine sensor error.

**Malfunction Caused:**

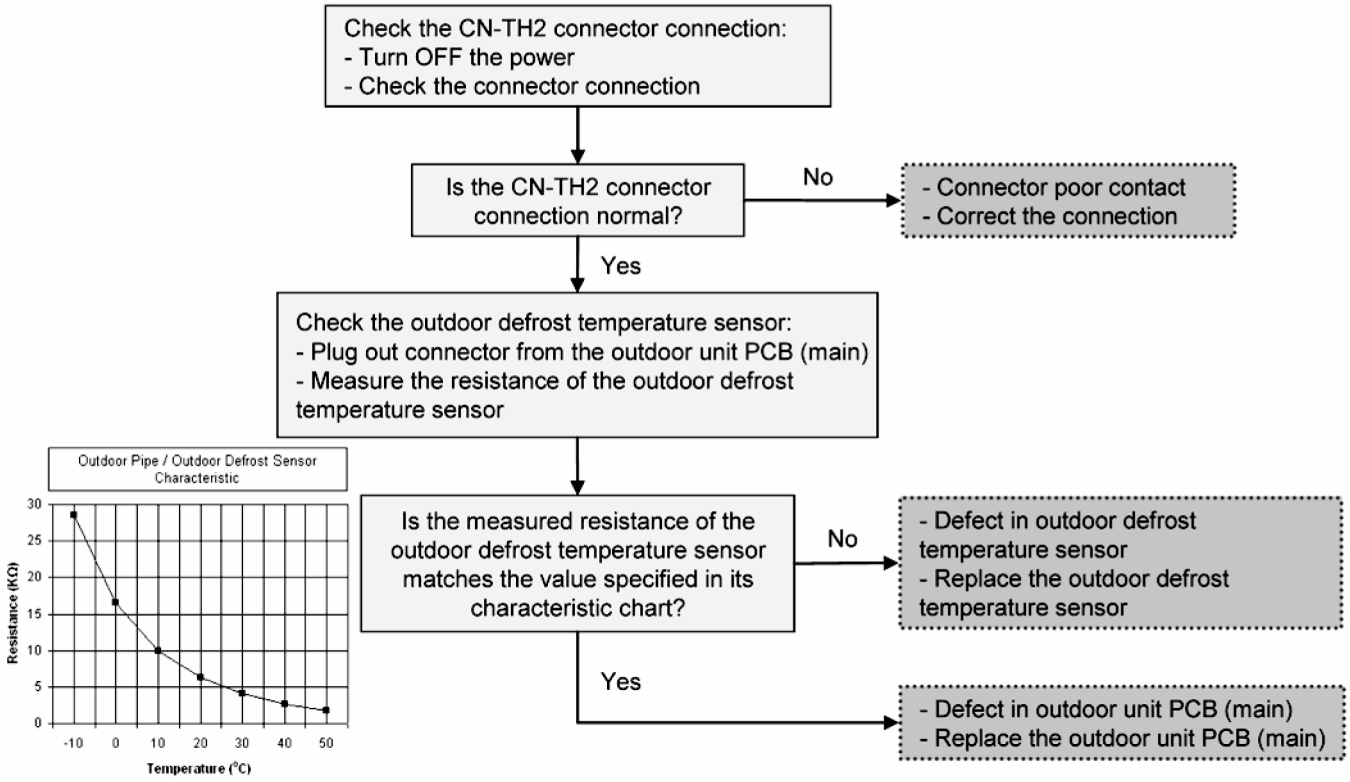
1 Faulty connector connection.
2 Faulty sensor.
3 Faulty outdoor unit PCB (main).

**Abnormality Judgment:**

Continue for 5 seconds.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.32 Indoor Water Outlet Temperature Sensor Abnormality (F45)

**Malfunction Decision Conditions:**

During startup and operation of heating, the temperatures detected by the indoor water outlet temperature sensor are used to determine sensor errors.

**Malfunction Caused:**

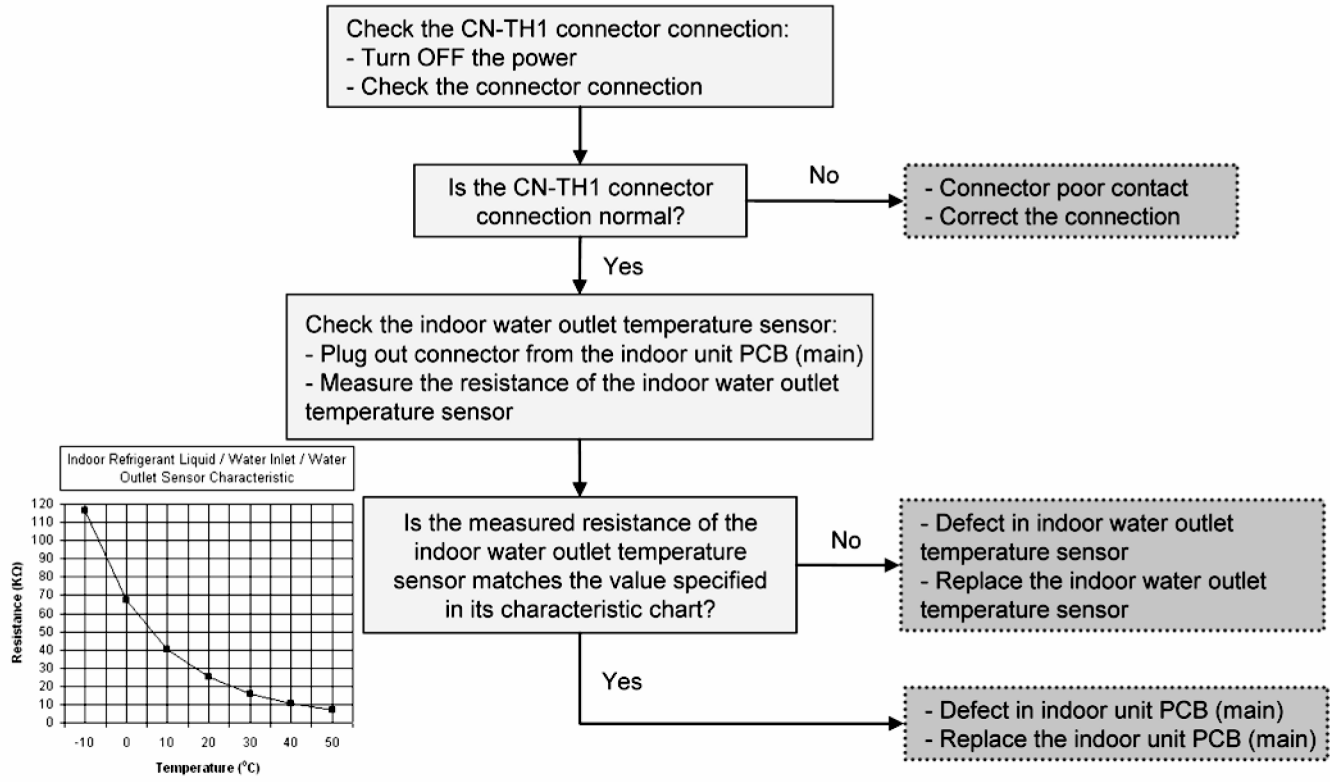
1 Faulty connector connection.
2 Faulty sensor.
3 Faulty indoor unit PCB (main).

**Abnormality Judgment:**

Continue for 5 seconds.

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.33 Outdoor Current Transformer Open Circuit (F46)

**Malfunction Decision Conditions:**

A current transformer (CT) open circuit is detected by checking the compressor running frequency (≥ rated frequency) and CT detected input current (< 0.65A) for continuously 20 seconds.

**Malfunction Caused:**

1 CT defective.
2 Faulty outdoor unit PCB.
3 Compressor defective (low compression).

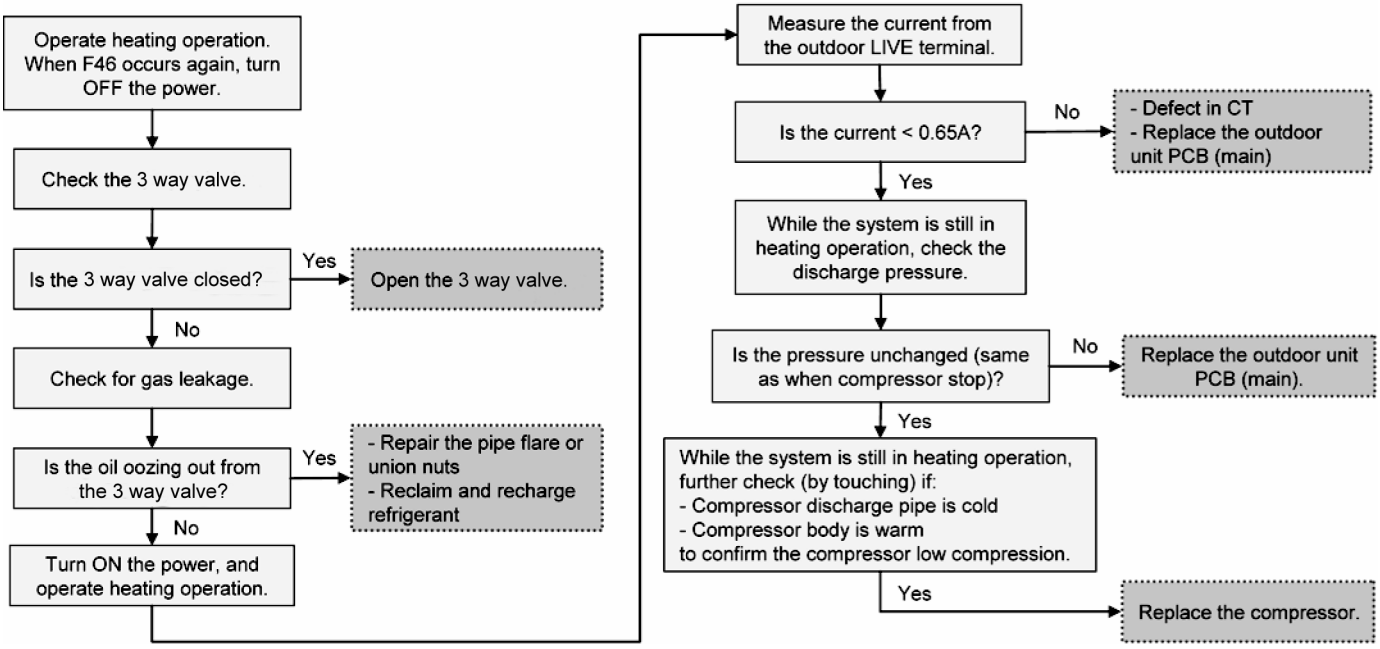
**Abnormality Judgment:**

Continue 3 times in 20 seconds.

**Troubleshooting:**

**Caution**

For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



## 16.5.34 Cooling High Pressure Overload Protection (F95)

**Malfunction Decision Conditions:**

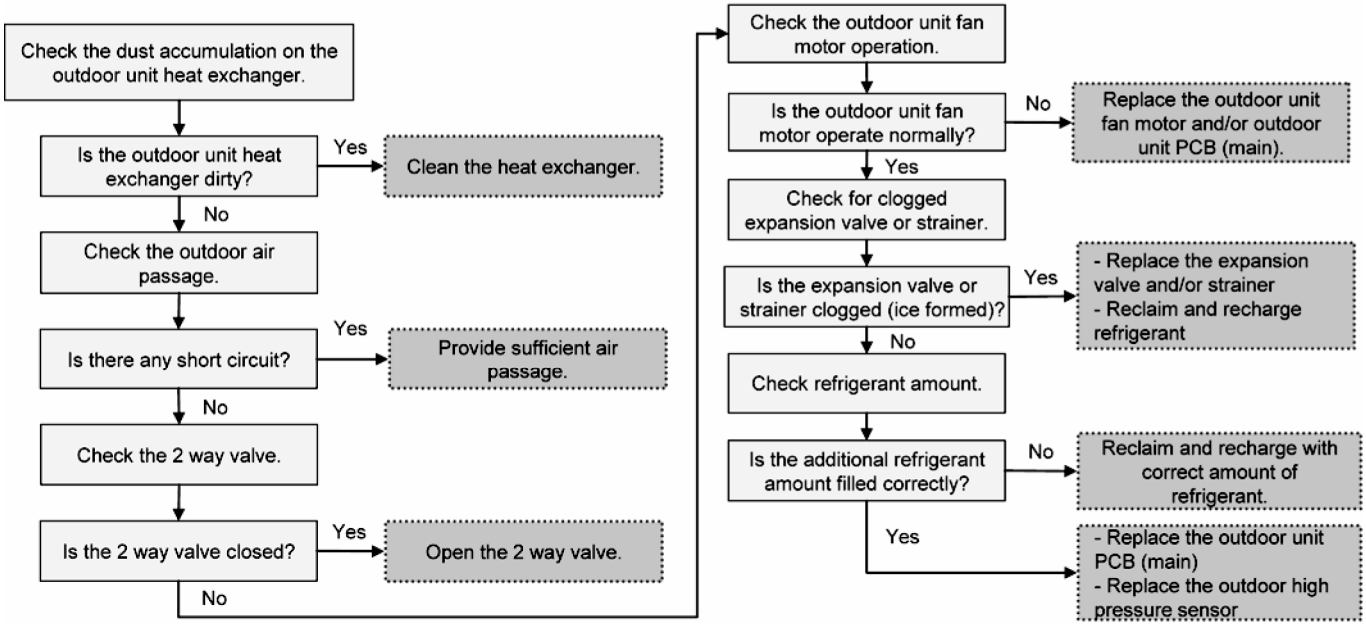
During operation of cooling, when pressure 4.0MPa and above is detected by outdoor high pressure sensor.

**Malfunction Caused:**

1 Dust accumulation in the outdoor unit heat exchanger.
2 Air short circuit at outdoor unit.
3 2 way valve closed.
4 Faulty outdoor unit fan motor.
5 Clogged expansion valve or strainer.
6 Excessive refrigerant.
7 Faulty outdoor high pressure sensor.
8 Faulty outdoor unit PCB (main).

**Troubleshooting:**

**Caution** For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.



# 17. Disassembly and Assembly Instructions

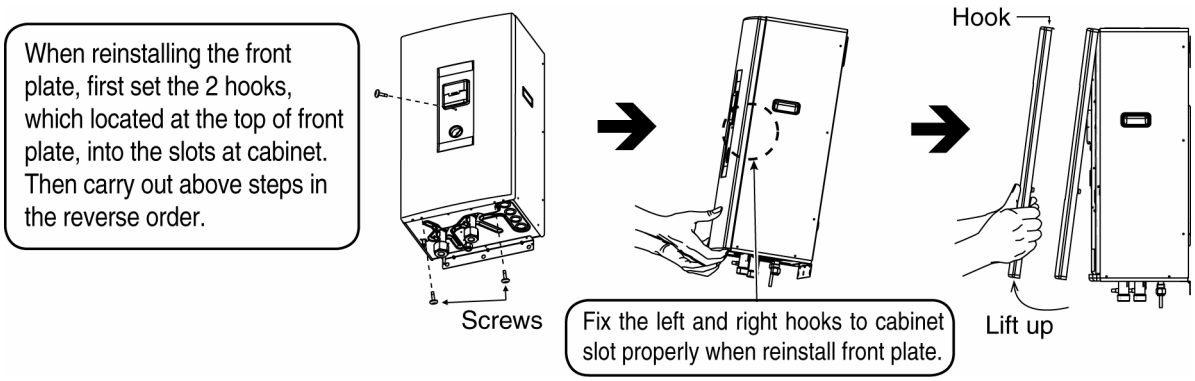
**WARNING**

High Voltage are generated in the electrical parts area by the capacitor. Ensure that the capacitor has discharged sufficiently before proceeding with repair work. Failure to heed this caution may result in electric shocks.

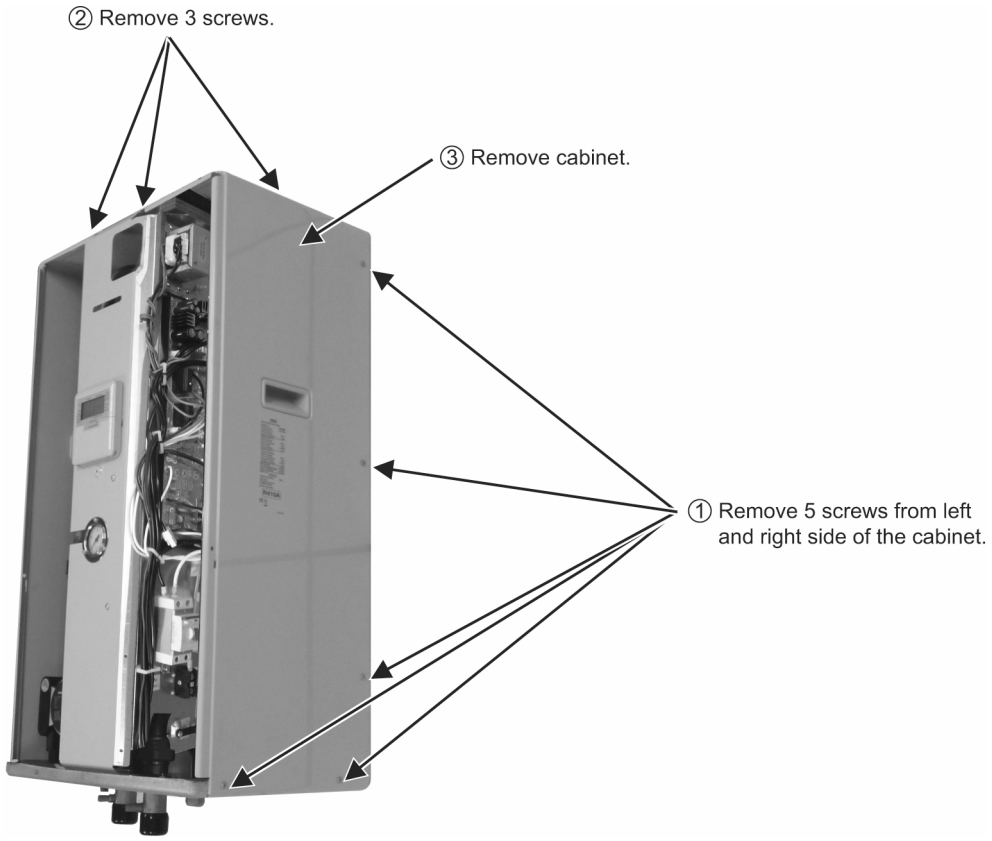
## *17.1 To Remove Front Plate*

Please follow the steps below for take out front plate. Before removing the front plate of indoor unit, always switch off all power supply (i.e. indoor unit power supply, heater power supply and tank unit power supply).

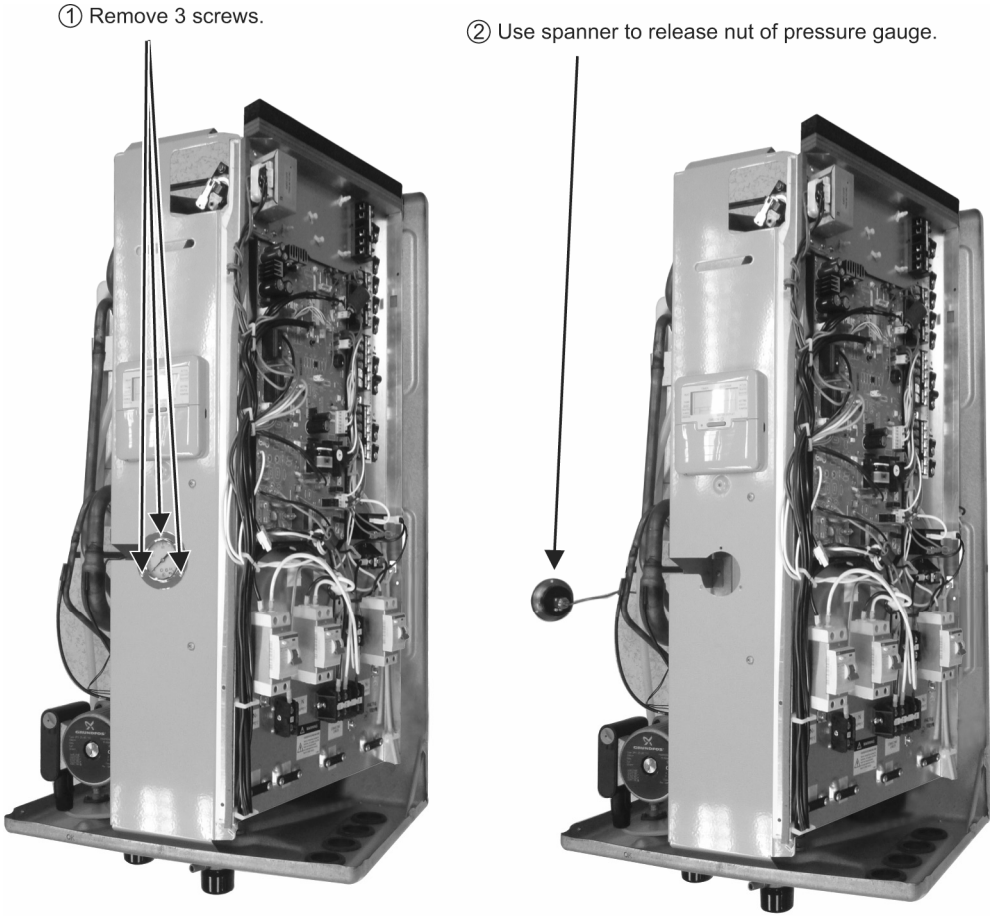
1 Remove the 2 mounting screws which located at bottom of the front plate and 1 mounting screw at the front of the plate.
2 Gently pull the lower section of the front plate towards you to remove the front plate from left and right hooks.
3 Hold the left edge and right edge of front plate to lift up front plate from hooks.



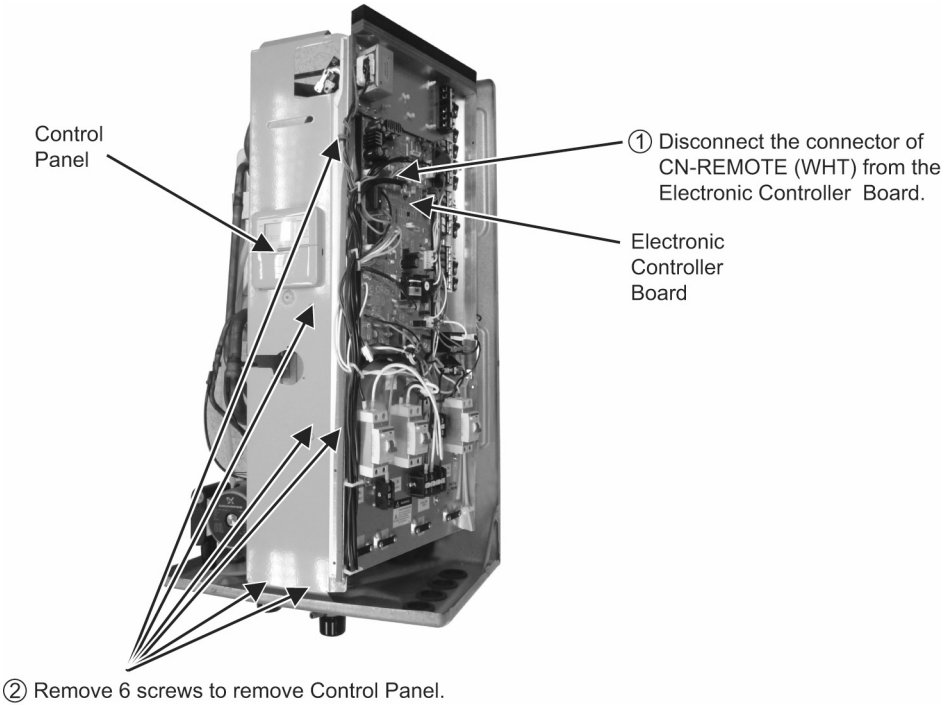

## *17.2 To Remove Cabinet Side Plate*



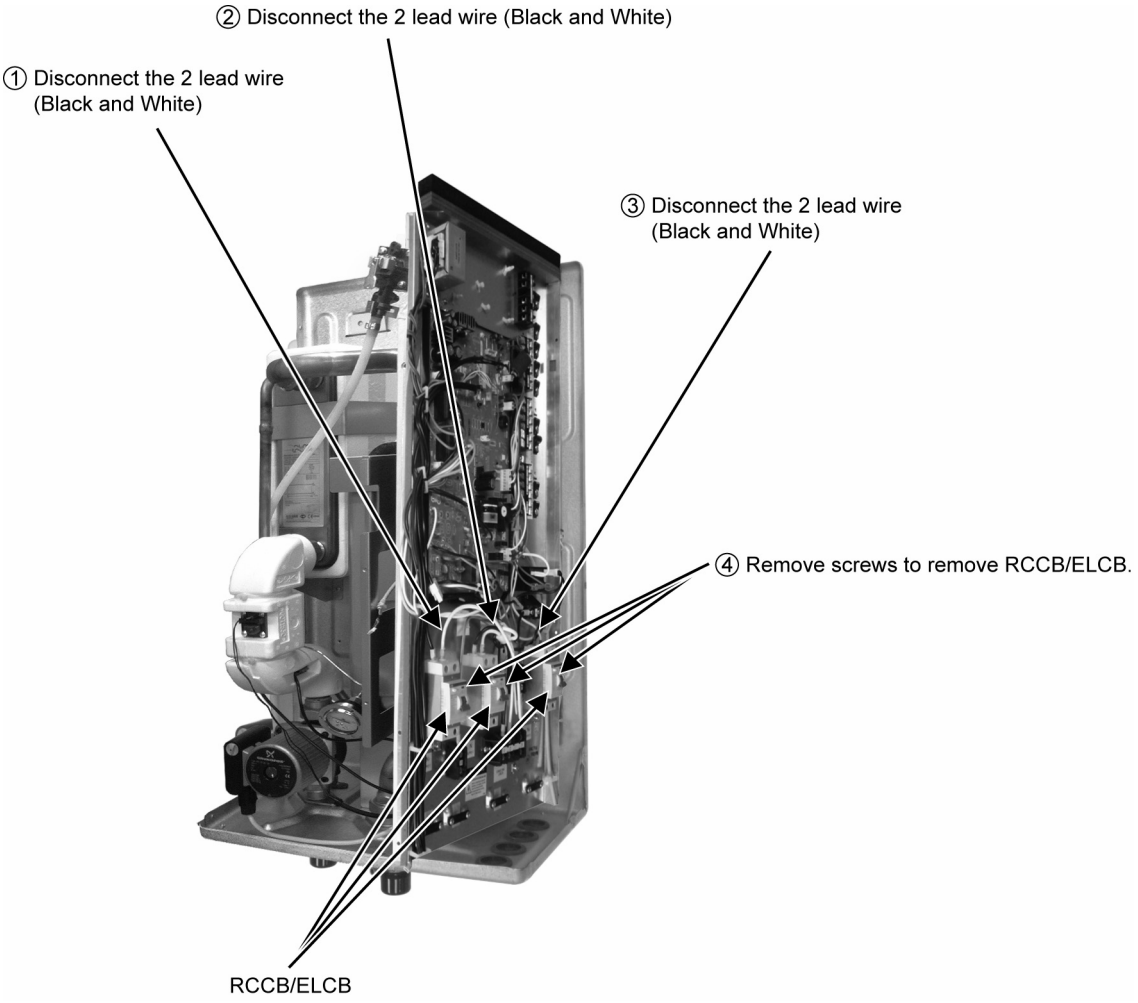
## 17.3 To Remove Pressure Gauge



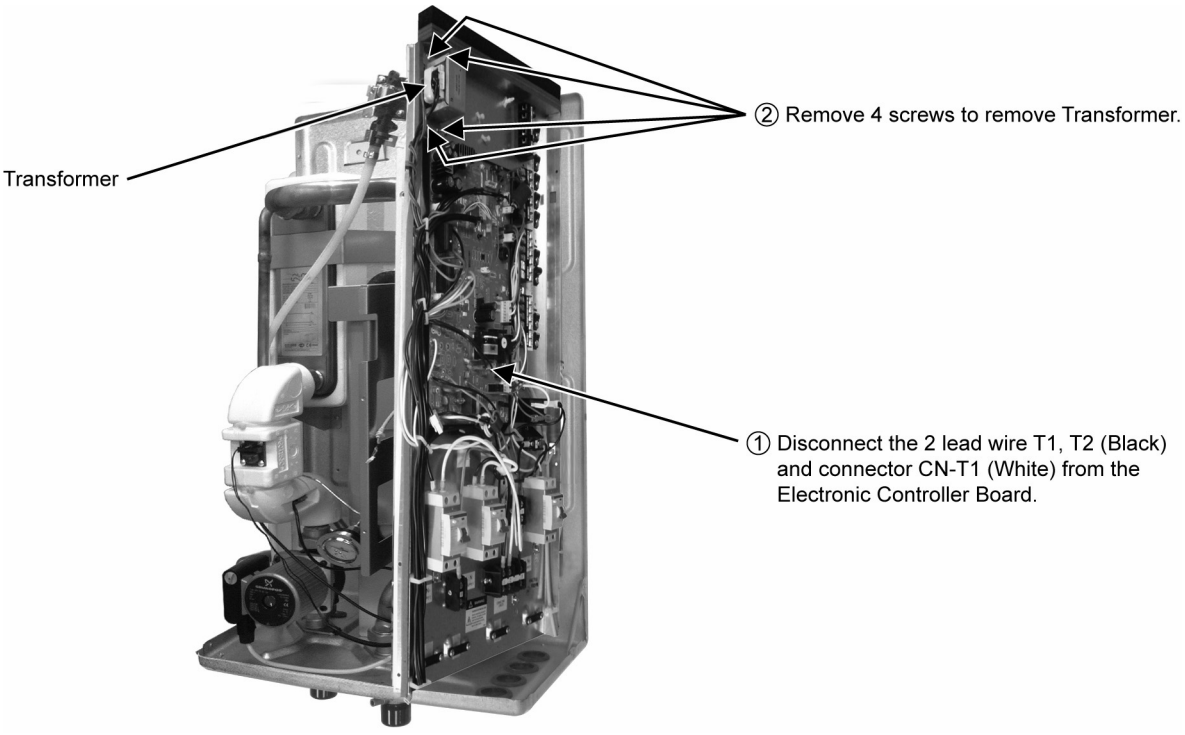

## 17.4 To Remove Control Panel

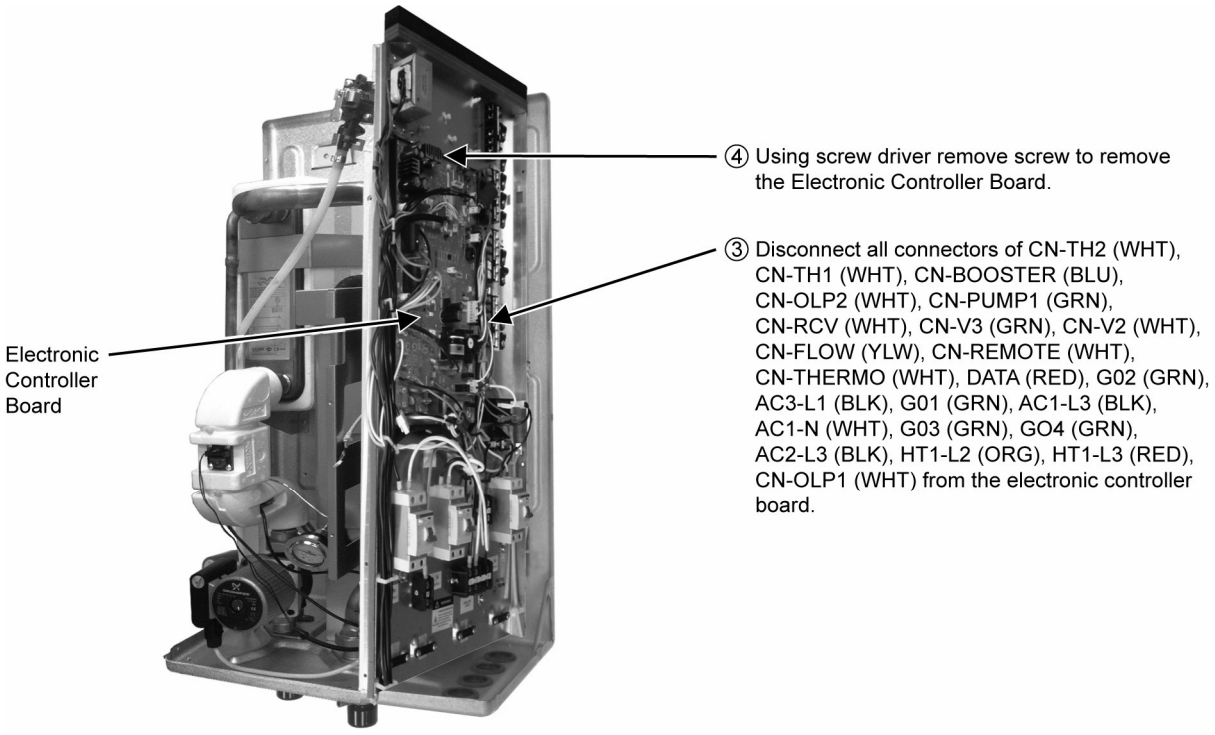


## 17.5 To Remove RCCB/ELCB

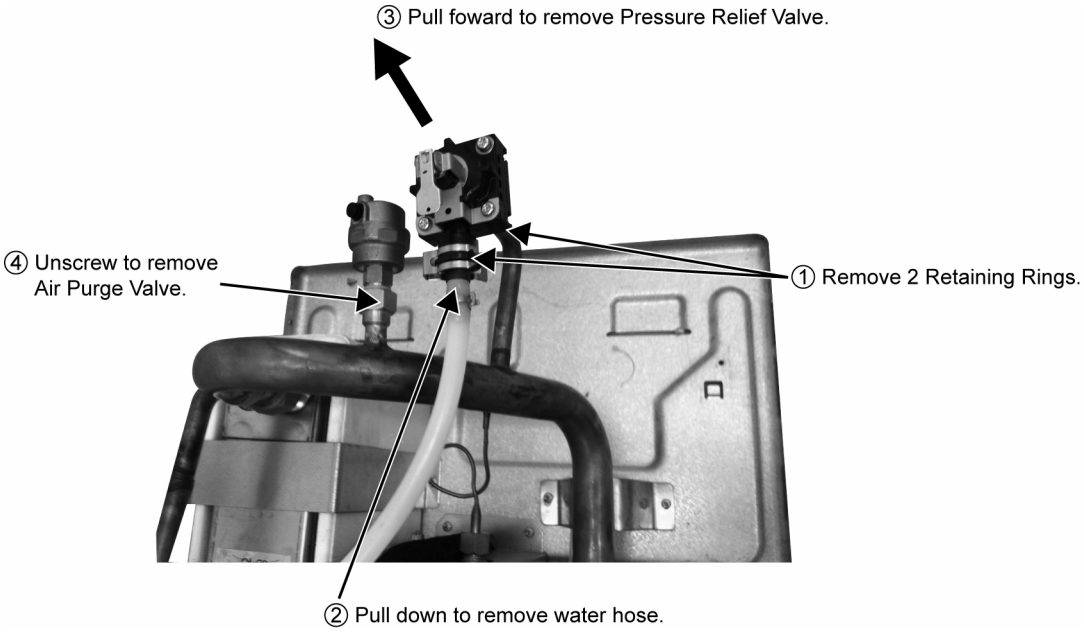



## 17.6 To Remove Transformer and Electronic Controller Board

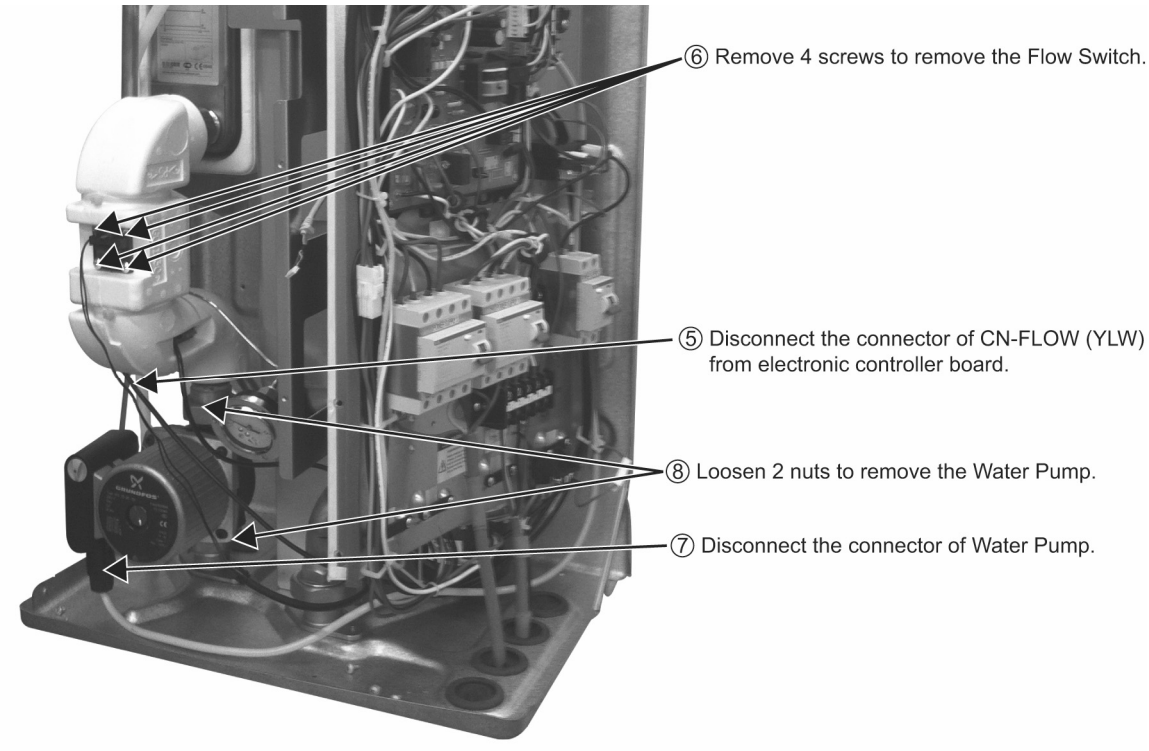




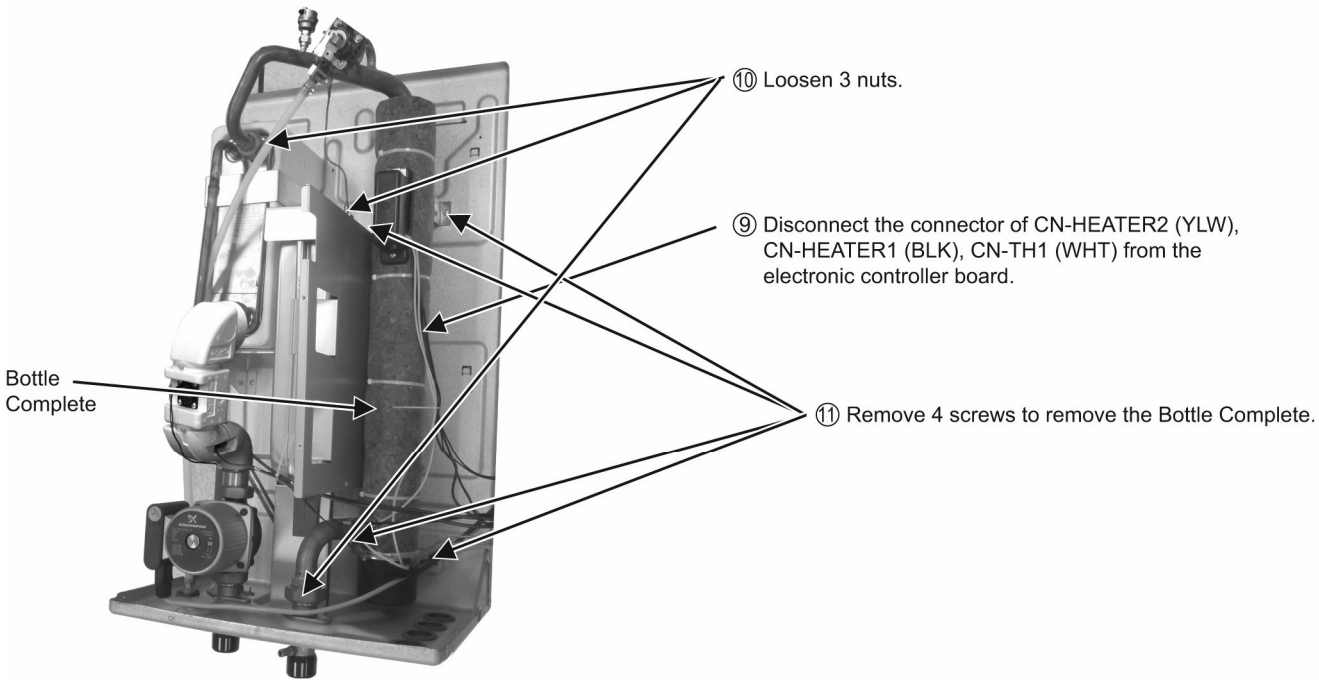

## *17.7 To Remove Air Purge Valve, Pressure Relief Valve, Flow Switch, Water Pump and Bottle Complete*




⚠ When reinstall the water pipe, use grease or water at the joining.




⚠ When reinstall the water pipe, use grease or water at the joining.




⚠ When reinstall the water pipe, use grease or water at the joining.

# 18. Technical Data

## *18.1 Heating Capacity Table*

### 18.1.1 WH-SHF09D3E5 WH-UH09DE5

| LWC | 30 | | 35 | | 40 | | 45 | |
|---|---|---|---|---|---|---|---|---|
| Tamb | HC | IP | HC | IP | HC | IP | HC | IP |
| -15 | 9000 | 3500 | 9000 | 3750 | 8900 | 4050 | 8800 | 4300 |
| -7 | 9000 | 3100 | 9000 | 3330 | 9000 | 3600 | 8900 | 3870 |
| 2 | 9000 | 2470 | 9000 | 2650 | 9000 | 2950 | 9000 | 3250 |
| 7 | 9000 | 1860 | 9000 | 1980 | 9000 | 2250 | 9000 | 2500 |
| 16 | 9000 | 1500 | 9000 | 1600 | 9000 | 1850 | 9000 | 2100 |
| 25 | 12000 | 1700 | 12000 | 1800 | 12000 | 2050 | 10800 | 2180 |

| LWC | 50 | | 55 | | 60 | | 65 | |
|---|---|---|---|---|---|---|---|---|
| Tamb | HC | IP | HC | IP | HC | IP | HC | IP |
| -15 | 8600 | 4650 | 8500 | 4950 | 8000 | 5100 | 7800 | 5900 |
| -7 | 8900 | 4150 | 8900 | 4500 | 8900 | 5000 | 8900 | 5500 |
| 2 | 9000 | 3590 | 9000 | 3920 | 9000 | 4390 | 9000 | 4800 |
| 7 | 9000 | 2800 | 9000 | 3100 | 9000 | 3500 | 9000 | 4000 |
| 16 | 9000 | 2400 | 9000 | 2700 | 9000 | 3150 | 9000 | 3600 |
| 25 | 10600 | 2500 | 10200 | 2700 | 10000 | 2950 | 9800 | 3350 |

HC: Heating Capacity (kW)
IP: Power Input (kW)
LWC: Leaving Water Condenser Temperature (°C)
Tamb: Ambient Temperature (°C)
Piping Length: 7m

### 18.1.2 WH-SHF12D6E5 WH-UH12DE5

| LWC | 30 | | 35 | | 40 | | 45 | |
|---|---|---|---|---|---|---|---|---|
| Tamb | HC | IP | HC | IP | HC | IP | HC | IP |
| -15 | 12000 | 5200 | 12000 | 5570 | 11000 | 5550 | 10600 | 5570 |
| -7 | 12000 | 4470 | 12000 | 4800 | 11500 | 4950 | 11200 | 5100 |
| 2 | 12000 | 3460 | 12000 | 3720 | 11500 | 3900 | 11300 | 4180 |
| 7 | 12000 | 2560 | 12000 | 2730 | 12000 | 3100 | 12000 | 3480 |
| 16 | 12000 | 2070 | 12000 | 2210 | 12000 | 2560 | 12000 | 2900 |
| 25 | 12000 | 1700 | 12000 | 1800 | 12000 | 2050 | 12000 | 2450 |

| LWC | 50 | | 55 | | 60 | | 65 | |
|---|---|---|---|---|---|---|---|---|
| Tamb | HC | IP | HC | IP | HC | IP | HC | IP |
| -15 | 10300 | 5670 | 9700 | 5800 | 9000 | 6050 | 8000 | 6150 |
| -7 | 10800 | 5200 | 10100 | 5320 | 9850 | 5700 | 9600 | 5950 |
| 2 | 11000 | 4550 | 10800 | 4900 | 10650 | 5350 | 10300 | 5630 |
| 7 | 12000 | 3850 | 12000 | 4320 | 12000 | 4900 | 12000 | 5450 |
| 16 | 12000 | 3450 | 12000 | 3900 | 12000 | 4350 | 12000 | 4800 |
| 25 | 12000 | 2680 | 12000 | 3000 | 12000 | 3450 | 12000 | 3900 |

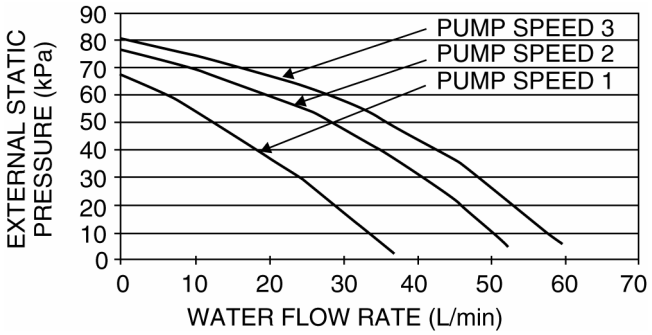
HC: Heating Capacity (kW)
IP: Power Input (kW)
LWC: Leaving Water Condenser Temperature (°C)
Tamb: Ambient Temperature (°C)
Piping Length: 7m

## 18.2 Heating Capacity at Different Piping Length

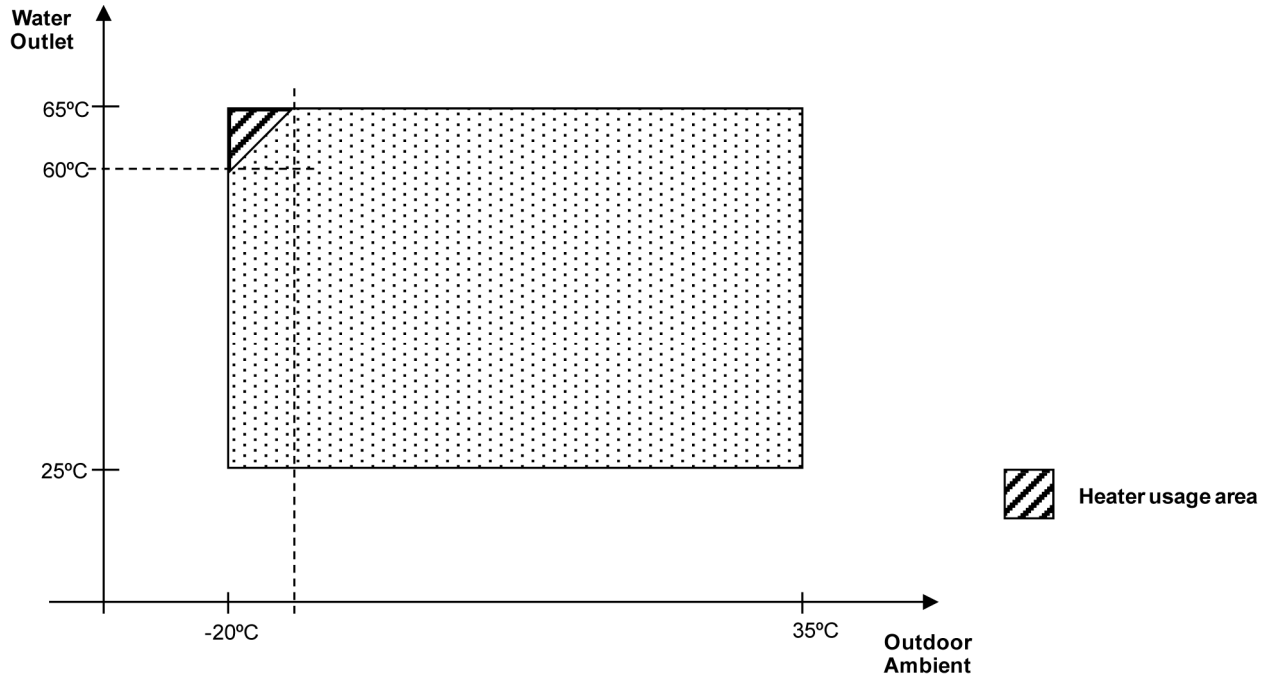
| Pipe Length | WH-SHF09 | | WH-SHF12 | |
|---|---|---|---|---|
| | HC | IP | HC | IP |
| 3 | 9000 | 1990 | 12000 | 2750 |
| 7 | 9000 | 1980 | 12000 | 2730 |
| 10 | 8000 | 1880 | 10300 | 2550 |
| 20 | 7400 | 1880 | 9500 | 2550 |
| 30 | 7000 | 1880 | 9000 | 2550 |

HC: Heating Capacity (kW)
IP: Power Input (kW)
Outdoor air temperature: 7°C (DBT), 6°C (WBT)
Indoor water inlet temperature: 30°C
Indoor water outlet temperature: 35°C
Piping Length: 7m

## 18.3 Hydraulic Pump Performance

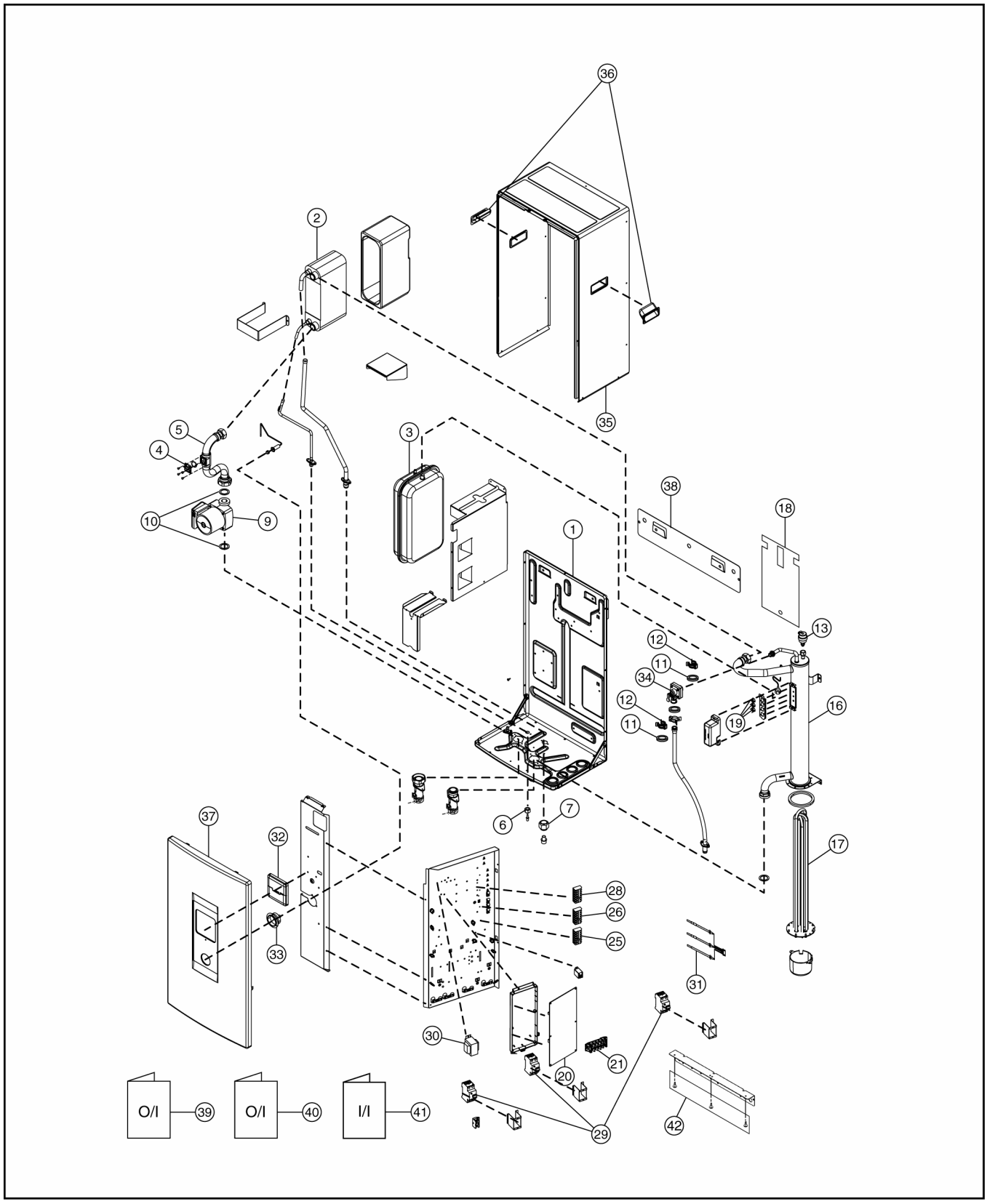



## 18.4 Usage Limitation



# 19. Exploded View and Replacement Parts List

## *19.1 WH-SHF09D3E5 WH-SHF12D6E5*




**Note:**

- The above exploded view is for the purpose of parts disassembly and replacement.
- The non-numbered parts are not kept as standard service parts.

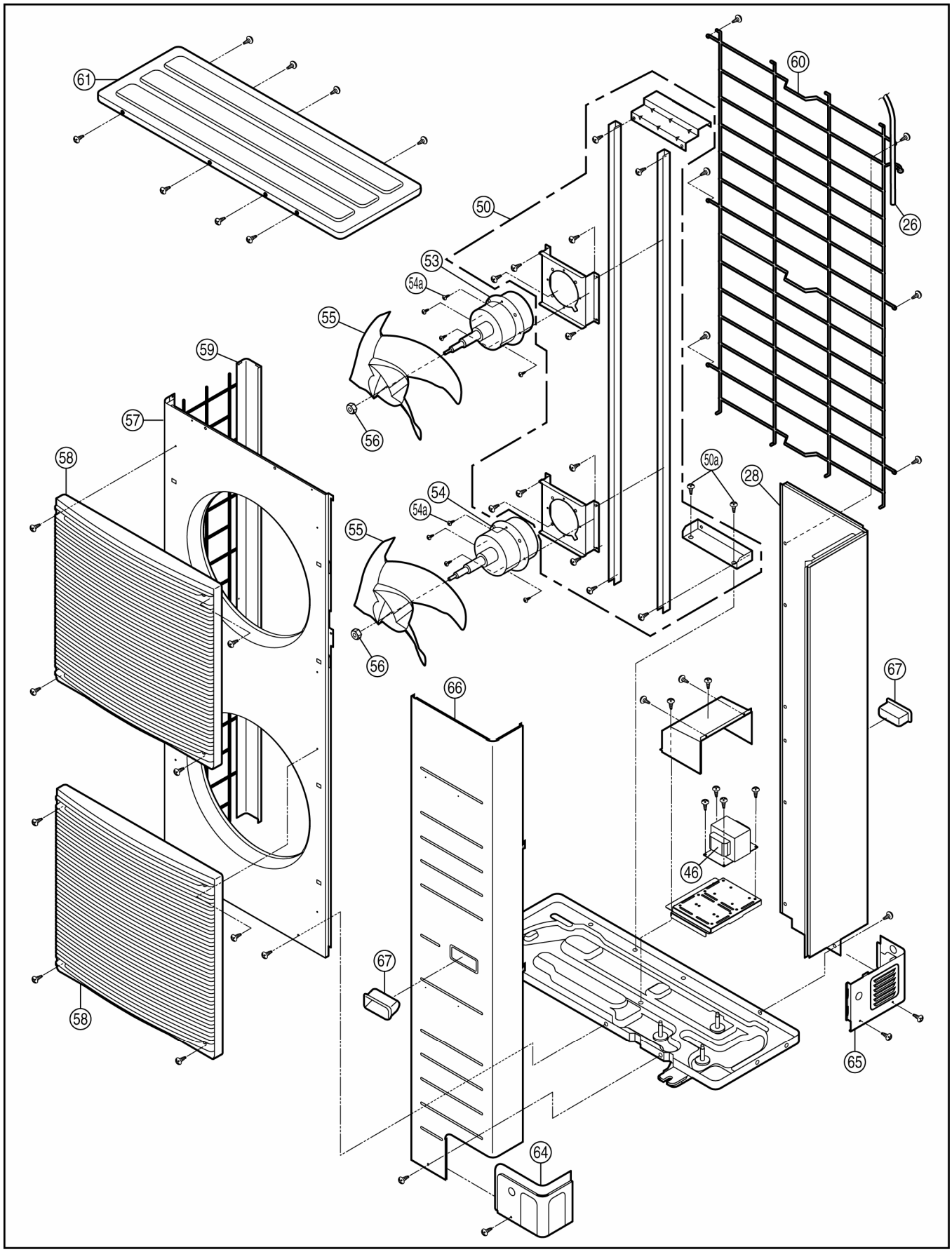
**< Model: WH-SHF09D3E5 WH-SHF12D6E5>**

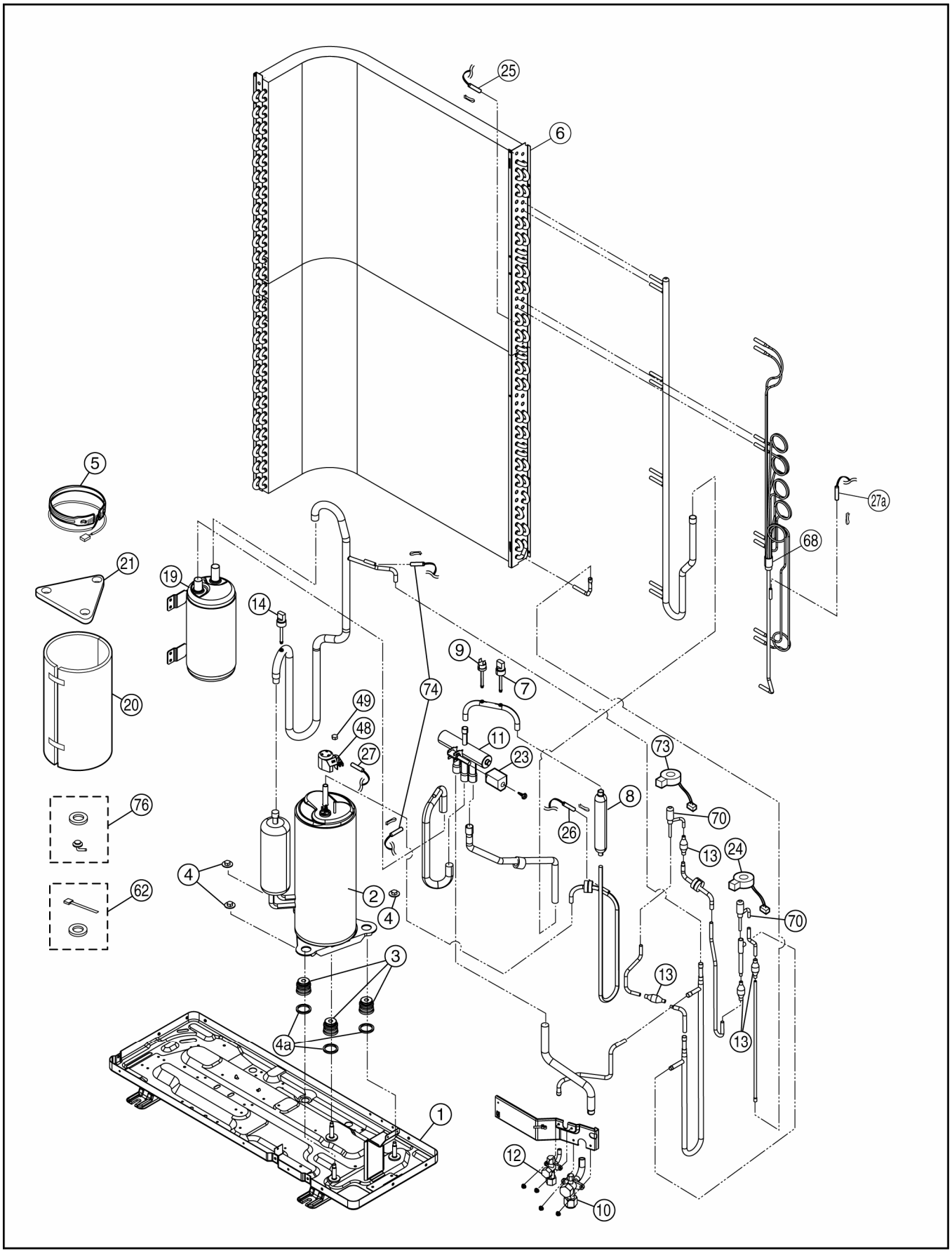
| REF. NO. | DESCRIPTION & NAME | QTY. | WH-SHF09D3E5 | WH-SHF12D6E5 | REMARKS |
|---|---|---|---|---|---|
| 1 | BASE PAN | 1 | CWD521266 | ← | |
| 2 | HOT WATER COIL-COMPLETE | 1 | CWB90C1035 | ← | O |
| 3 | RECEIVER | 1 | CWB141039 | ← | |
| 4 | FLOAT (FLOW SWITCH) | 1 | CWB601008 | ← | O |
| 5 | TUBE CONNECTOR-COMPLETE | 1 | CWT29C1043 | ← | |
| 6 | FLARE NUT (5/8) | 1 | CWT251061 | ← | |
| 7 | FLARE NUT (7/8) | 1 | CWT251064 | ← | |
| 9 | PUMP | 1 | CWB532096 | ← | O |
| 10 | PACKING (O-RING) I.D 32mm | 2 | CWB811082 | ← | |
| 11 | PACKING (O-RING) I.D 13.8mm | 2 | CWB811022 | ← | |
| 12 | RETAINING RING D:22mm | 2 | CWH581007 | ← | |
| 13 | VALVE BODY (AIR TO WATER) | 1 | CWB621094 | ← | |
| 16 | BOTTLE COMPLETE | 1 | CWH90C0027 | CWH90C0028 | |
| 17 | HEATER ASS'Y | 1 | CWA34K1014 | CWA34K1020 | O |
| 18 | SOUND PROOF MATERIAL | 1 | CWG302595 | CWG302702 | |
| 19 | THERMOSTAT | 2 / 3 | CWA151065 | ← | O |
| 20 | ELECTRONIC CONTROLLER-MAIN | 1 | CWA73C6516 | CWA73C6517 | O |
| 21 | TERMINAL BOARD ASS'Y | 1 | CWA28K1217 | ← | |
| 25 | TERMINAL BOARD ASS'Y | 1 | CWA28K1229 | ← | |
| 26 | TERMINAL BOARD ASS'Y | 1 | CWA28K1230 | ← | |
| 28 | TERMINAL BOARD ASS'Y | 1 | CWA28K1231 | ← | |
| 29 | RESIDUAL CURRENT CIRCUIT BREAKER | 2 / 3 | CWA181005 | ← | O |
| 30 | TRANSFORMER-COMPLETE | 1 | CWA40C1096 | ← | O |
| 31 | SENSOR-COMPLETE | 1 | CWA50C2762 | ← | O |
| 32 | REMOTE CONTROL COMPLETE | 1 | CWA75C3998 | ← | O |
| 33 | PRESSURE GAUGE | 1 | CWB070001 | ← | O |
| 34 | VALVE BODY (AIR TO WATER) | 1 | CWB621092 | ← | |
| 35 | CABINET | 1 | CWE001050A | ← | |
| 36 | HANDLE | 2 | CWE161008 | ← | |
| 37 | CABINET FRONT PLATE | 1 | CWE061265A | ← | |
| 38 | INSTALLING HOLDER | 1 | CWH361103A | ← | |
| 39 | OPERATING INSTRUCTION | 1 | CWF568253 | ← | |
| 40 | OPERATING INSTRUCTION | 1 | CWF568677 | ← | |
| 41 | INSTALLATION INSTRUCTION | 1 | CWF614964 | ← | |
| 42 | ACCESSORY-COMPLETE | 1 | CWH82C1754 | ← | |

**Note:**

- All parts are supplied from PAPAMY, Malaysia (Vendor Code: 00029488).
- “O” marked parts are recommended to be kept in stock.

## 19.2 WH-UH09DE5 WH-UH12DE5




25
6
5
27a
68
21
19
14
9
7
74
49
48
27
11
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76
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70
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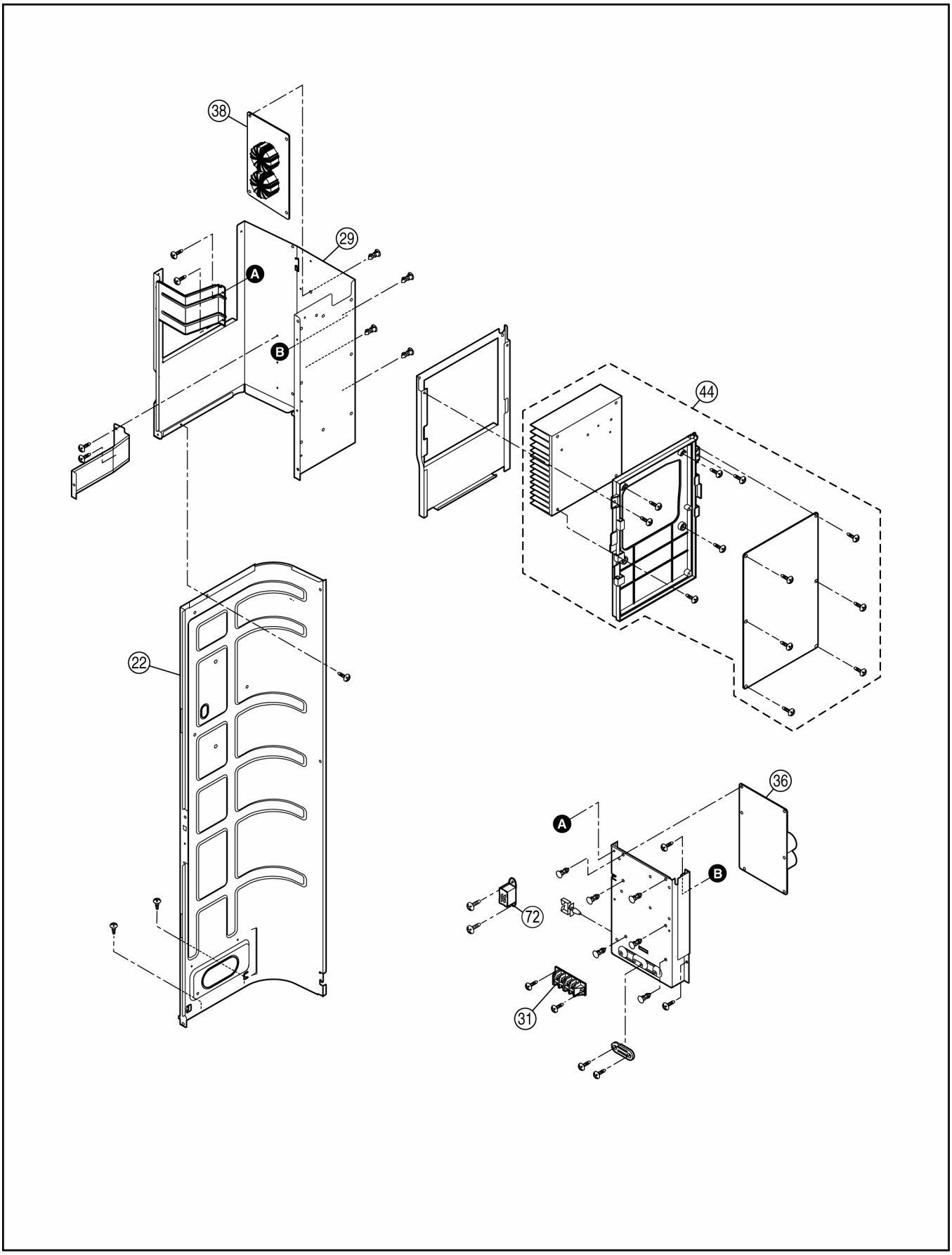
13
4a
13
1
12
10




**Note:**

- The above exploded view is for the purpose of parts disassembly and replacement.
- The non-numbered parts are not kept as standard service parts.

**< Model: WH-UH09DE5  WH-UH12DE5>**

| REF. NO. | DESCRIPTION & NAME | QTY. | WH-UH09DE5 | WH-UH12DE5 | REMARKS |
|---|---|---|---|---|---|
| 1 | BASE PAN ASS'Y | 1 | CWD52K1275 | ← | |
| 2 | COMPRESSOR | 1 | 4JD650XAA22 | ← | O |
| 3 | BUSHING - COMPRESSOR MOUNT | 3 | CWH50055 | ← | |
| 4 | NUT-COMPRESSOR MOUNT | 3 | CWH561049 | ← | |
| 4a | PACKING | 3 | CWB811017 | ← | |
| 5 | CRANKCASE HEATER | 1 | CWA341053 | ← | |
| 6 | CONDENSER COMPLETE | 1 | CWB32C3494 | ← | |
| 7 | HIGH PRESSURE SENSOR | 1 | CWA50C2570 | ← | |
| 8 | DISCHARGE MUFFLER | 1 | CWB121014 | ← | |
| 9 | PRESSURE SWITCH | 1 | CWA101013 | ← | |
| 10 | 3-WAYS VALVE (GAS) | 1 | CWB011251 | ← | |
| 11 | 4-WAYS VALVE | 1 | CWB001046 | ← | |
| 12 | 3-WAYS VALVE (LIQUID) | 1 | CWB011292 | ← | |
| 13 | STRAINER | 4 | CWB111032 | ← | |
| 14 | LOW PRESSURE SENSOR | 1 | CWA50C2571 | ← | |
| 19 | ACCUMULATOR ASS'Y | 1 | CWB131026A | ← | |
| 20 | SOUND PROOF MATERIAL | 1 | CWG302265 | ← | |
| 21 | SOUND PROOF MATERIAL | 1 | CWG302266 | ← | |
| 22 | SOUND PROOF BOARD ASS'Y | 1 | CWH15K1019 | ← | |
| 23 | V-COIL COMPLETE - 4-WAYS VALVE | 1 | CWA43C2169J | ← | O |
| 24 | V-COIL COMPLETE - EXP.VALVE | 1 | CWA43C2478 | ← | O |
| 25 | SENSOR-COMP. TEMP COIL | 1 | CWA50C2730 | ← | |
| 26 | SENSOR-COMP. DISCHARGE | 1 | CWA50C2576 | ← | |
| 27 | SENSOR-COMP. TOP | 1 | CWA50C2629 | ← | |
| 27a | SENSOR-COMP. DEF | 1 | CWA50C2577 | ← | |
| 28 | CABINET REAR PLATE-COMPLETE | 1 | CWE02C1067 | ← | |
| 29 | CONTROL BOARD CASING | 1 | CWHH10K1049 | ← | |
| 31 | TERMINAL BOARD ASS'Y | 1 | CWA28K1213 | ← | |
| 36 | ELECTRONIC CONTROLLER (CAPACITOR) | 1 | CWA746082 | ← | O |
| 38 | ELECTRONIC CONTROLLER (NOISE FILTER) | 1 | CWA746991 | ← | O |
| 44 | ELECTRONIC CONTROLLER (MAIN) | 1 | CWA73C6518R | CWA73C6519R | O |
| 46 | REACTOR | 1 | G0C592J00006 | ← | |
| 48 | TERMINAL COVER | 1 | CWH171054 | ← | |
| 49 | NUT-TERMINAL COVER | 1 | CWH7080300J | ← | |
| 50 | FAN MOTOR BRACKET | 1 | CWD54K1024 | ← | |
| 50a | SCREW-FAN MOTOR BRACKET | 2 | CWH551040J | ← | |
| 53 | FAN MOTOR | 1 | EHDS80AAC | ← | O |
| 54 | FAN MOTOR | 1 | EHDS80BAC | ← | O |
| 54a | SCREW-FAN MOTOR MOUNT | 8 | CWH551323 | ← | |
| 55 | PROPELLER FAN ASSY | 2 | CWH00K1006 | ← | |
| 56 | NUT FOR PROPELLER FAN | 2 | CWH561038J | ← | |
| 57 | CABINET FRONT PLATE | 1 | CWE061098A | ← | |
| 58 | DISCHARGE GRILLE | 2 | CWE201073 | ← | |
| 59 | CABINET SIDE PLATE ASSY | 1 | CWE04K1023A | ← | |
| 60 | WIRE NET | 1 | CWD041103A | ← | |
| 61 | CABINET TOP PLATE CO. | 1 | CWE03C1096 | ← | |
| 62 | ACCESSORY-COMPLETE | 1 | CWH82C1535 | ← | |
| 64 | PIPE COVER (FRONT) | 1 | CWD601074A | ← | |
| 65 | PIPE COVER (BACK) | 1 | CWD601075A | ← | |
| 66 | CABINET FRONT PLATE CO. | 1 | CWE06C1091 | ← | |
| 67 | HANDLE | 2 | CWE161008 | ← | |
| 68 | TUBE ASSY (CAP.TUBE) | 1 | CWT07K1619 | ← | |
| 70 | EXPANSION VALVE | 2 | CWB051029 | ← | |

| REF. NO. | DESCRIPTION & NAME | QTY. | WH-UH09DE5 | WH-UH12DE5 | REMARKS |
|---|---|---|---|---|---|
| 72 | MAGNET RELAYS | 1 | K6C1AYY00003 | ← | |
| 73 | V-COIL COMPLETE - EXP. VALVE (BYPASS) | 1 | CWA43C2335 | ← | |
| 74 | SENSOR-COMP. TEMP COIL (BYPASS) | 1 | CWA50C2797 | ← | |
| 76 | ACCESSORY CO.(DRAIN ELBOW) | 1 | CWG87C2030 | ← | |

**Note:**

- All parts are supplied from PAPAMY, Malaysia (Vendor Code: 00029488).
- “O” marked parts are recommended to be kept in stock.